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THE PROBLEM OF THE UPPER YANG-TZE PROVINCES AND THEIR COMMUNICATIONS.*

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In an address which I had the honour of delivering before the Fellows of this Society eighteen months ago, I dealt with journeys of exploration made to the upper Yang-tze provinces in 1900 and 1901–2, in which we started in the one instance from Burma, and examined the approaches into Se-chuan from its western side, and in the other, coming down from the Yellow river, we examined the watershed between the upper waters of the Han river and the Se-chuan basin.

Se-chuan is not only the largest, but is the most wealthy of all the eighteen provinces of China. It has a total area of 181,000 square miles, of which 80,000 square miles, comprising the eastern and central portions, are occupied by the Red Basin formation, which supports a population of nearly fifty millions, the Chinese census giving even a higher figure.

To-night I propose to deal briefly with a journey made during the past year of 1904, in which the approaches from the lower Yang-tze provinces or eastern side of Se-chuan were examined, together with a large portion of the Han river valley and the watershed country between the latter and the eastern Se-chuan basin, a region about which little has hitherto been known to Europeans, and which, together with much of the country to the north and south of the Yang-tze, above Ichang, was for the first time accurately mapped. The importance of these regions lies in the fact that they might possibly afford a route by which the problem of opening up proper communications between the rich province of Se-chuan and the outer world might be solved.

* Read at the Royal Geographical Society, April 10, 1905. Map, p. 700.

The only means of communication which at present exist are those afforded by the Yang-tze river, which unfortunately, at Ichang, 1000 miles from the ocean, and whilst still some hundreds of miles short of the principal Se-chuan ports, ceases to be the fine waterway for commerce it has up to this point proved.

Above Ichang the river becomes wholly unsuited to steam navigation for the purposes of trade, and, under the existing limitations of steam power, it is unlikely that it will ever become a through channel of communication for steamships other than gunboats at fitful intervals. Merchandise at present can only reach Se-chuan after a protracted and perilous journey in junks, which often covers months, and in some seasons cannot be undertaken at all. The waterway failing as a means of communication, attention has naturally been turned to the facilities which a railway would afford in linking up this rich and populous province of Se-chuan with an ocean port, or a river port accessible to steamships.

The province of Yunnan and its approaches, through which connection might be made from the Indian ocean or gulf of Tong-king to Se-chuan, has been most carefully mapped and reported on by British and by French explorers, and, thanks largely to the surveys of Major H. R. Davies of the Oxford Light Infantry, there is now little of Yunnan which is not thoroughly known to us.

There is no doubt but that eventually Se-chuan will be tapped from the Yun-nan side, but this, on account of the difficulties which the route presents, is a matter which can only be slowly accomplished, but as I propose to allude to this question later on, I will not dwell on it further now.

In these days of rapid progress, commercial enterprise is not likely to let one of the Earth's richest regions, with a prosperous population ready to trade and numbering fifty millions or more, to remain cut off from its reach; so that, the Yun-nan route not being immediately available, the efforts of those nations interested in Se-chuan and its trade have been for some time turned towards finding a practicable route from another side.

Accordingly, in 1900, the late Captain Watts-Jones, who had already done much good work in Yunnan, and whose untimely end in his last journey must ever be deplored by those interested in this problem, made a journey from the neighbourhood of the Tung-ting lake in Hu-nan to Fu-cho on the Yang-tze, in Se-chuan. His report is one full of interest, but he was forced to confess that he could see no prospect of establishing railway communication between Hu-nan and Se-chuan.

In 1901–2, after the "Boxer" outbreak, I was sent in charge of a party, consisting of Captain Hunter, R.E., and two surveyors, to explore the approaches from the upper waters of the Han river into Se-chuan; and Captain Hunter, on the return journey, examined a route to the

south of the Yang-tze into Hu-peh, and at the same time was enabled to form a very good idea of the nature of the country which lay between his and Watts-Jones's route.

In this exploration of 1901–2 we did not follow the route up the Han river from Hankau, by which, under ordinary circumstances, its head-waters would have been reached, but we travelled from the Yellow river across the Chin-ling ranges, so that though, in the course of our journey,

A STREAM NEAR TA NING HSIEN WHICH DISAPPEARED INTO A HOLE.

the upper part of the Han river basin was mapped, and much knowledge of it was gained, yet the country drained by it and its affluents between Tzu-yang and Hsiang-yang-Fu, a distance along the river of about 400 miles was unsurveyed, and all the country to the south away from the actual river-banks remained quite unknown.

Up to Hsiang-yang-Fu, which is 300 miles from its junction with the Yang-tze, the Han river has been fully reported on by Captain McSwiney and Mr. Currie, who were members of the large survey party which, under the command of Mr. J. G. H. Glass, C.I.E., carried out such extensive survey operations in 1899 in Honan, Shansi, and Chih-li.

It was largely due to the grasp then obtained by Mr. Glass of the problems affecting British interests in China, and to his foresight, that the present operations were undertaken; and the support and encouragement of Sir Ernest Satow, which has always been so readily afforded to all projects of exploration, enabled the necessary preliminaries to be successfully carried out, so that in January, 1904, I found myself again in China in charge of a party which was to examine the eastern approaches into Se-chuan, including this unsurveyed portion of the Han river basin. It consisted of Captain E. Barnardiston, R.E., Captain E. Mahon, R.E., Mr. C. G. Nix, and five Indian surveyors.

From Shanghai we proceeded to Hankau by river steamer. There are seven lines running down between these places, three British, one Japanese, one French, one German, and one Chinese. Even at the season of low water, which was that of our voyage, these steamers can carry 2000 tons of cargo while they draw 7 feet of water up to Hankau.

We had on board a Chinese gentleman in the Bureau of Imperial Railways. He was on his way to Kiangsu to see about machinery for coal-mines there; the coal was brought up to the iron foundries opposite Hankau, where over one thousand workmen are employed.

A small local railway, which is being made in connection with these collieries to connect them with the Yuan river, is entirely under Chinese control and management. I was told of another small railway near Amoy, which has been made entirely by the Chinese, and the locomotives for which have been made in the Tong-shan workshops. The latter, under Mr. Kinder's management, will, it is said, soon be able to supply all the locomotives which China will require on the Chinese Imperial Railways.

All these are signs of the wonderful age of progress which is setting in in China, and of the advance which is being made by the Chinese themselves, though as yet only in a small way.

At Hankau we made a few days' halt to organize, and we prepared our plan of exploration, so that we should, by dividing into small parties, be able to cover as much ground as possible. I, with the main party, worked up to Hsiang-Yang-Fu *viâ* the large cities of Te-an and Sui-cho, whilst Captain Mahon, with two surveyors, went up to Sin-yang by railway, and thence worked to Hsiang-Yang-Fu. Thence he was to continue to follow, *viâ* Fang-Cheng, the overland route to Hing-an-Fu on the Han river. And whilst Captain Barnardiston was to survey along the main valley of the Han river to the last-named city, Mr. Nix and I worked up the valley of the Ton-Ho, a large affluent which enters the Han river a little above Yun-yang Fu.

On leaving Hankau, our party travelled for about 100 miles by the Peking-Hankau railway before we branched off from it in a north-west direction. This line has so often been described that it is hardly worth

while dwelling on it here, beyond pointing out that passengers can now book on it right through from Peking to the Yang-tze with only one interruption at the Yellow river, which is still unbridged, and is likely to remain so for some years yet, as the bridging of it will be a very big undertaking.

The Chinese have taken readily to this line as a means of transport for themselves and their merchandise, and it has begun to make profits already. It is entirely in continental hands; the higher staff is recruited from France and Belgium; the rolling stock and workshops and plant are supplied from these countries. Its terminus is in the French settlement at Hankau, and it is a great centre for continental influence throughout Central China.

This railway is to be prolonged another 1000 miles to Canton, and it seems very probable under the same Continental influences, unless the Americans, who at present hold the control, take steps to ensure its retention in their hands.

Our route took us through a part of Hu-peh which at first showed no great signs of wealth, the villages appearing poverty-stricken, with little of the solid comfort one sees either in the north or in Se-chuan. Every night we halted at whatever village we arrived at by dusk. But though the accommodation was of the scantiest and barest, we found the people most friendly and desirous of making our path as smooth as possible. I have never in any part of China suffered less from disagreeableness and annoying inquisitiveness than in this part of Hu-peh. I should certainly place its people first for amiability and good feeling towards foreigners.

As we approached the large city of Sui-cho, we began to come on greater signs of prosperity. The plain of Sui-cho is as densely populated as any part of China, and a great trade in locally manufactured cloth is carried on from its neighbourhood and sent all over the country. The only transport used, until the railway or a navigable affluent of the Han river is reached, is the wheelbarrow.

There is no doubt but that a good cart-road could be easily made; but whether it is due to the fact that draught-animals are not bred in any numbers, or that from time immemorial wheelbarrows have been used, these latter alone hold the field, and no attempt has been made to construct roads suitable for any other form of wheeled vehicle. In fact, where the route goes over country along which, if very little was done to the road, carts could travel, the streams are either unbridged and crossed by ferries, or are crossed by single spans of stone which admit of nothing wider than a wheelbarrow. These wheelbarrows, however, are by no means to be despised as a means of transport. Hundreds of them were passed by us, each loaded with at least five and often seven or eight of the bales of narrow cotton-cloth made in the surrounding districts, each of these bales weighing about 17 lbs.

One man would wheel a barrow carrying 350 lbs. and make his 12 to 20 miles a day, more than double the amount which the Government pack-mule is allowed to carry in India; and the same human beast of burden will go on making the journey cheerfully day in and day out, without any halts for lameness or sore backs.

My admiration for the Chinese coolie is unbounded; there is no man in the world who does the same patient, laborious work so cheerfully.

Further on, when we came to the mountainous watershed country, where only back-loads are possible, I became still more confirmed in this opinion. Often after a long and weary day with the surveyors, in the course of which we would have climbed up from 5000 to 8000 feet, and made several such ascents and descents, having, perhaps, been on the move from five in the morning until dusk, we would come in, rather inclined to pat ourselves on the back at the thought of what a hard day's work we had successfully accomplished, only to find that the Chinese coolies had made as good time, each man having covered nearly as much ground with a load of 100 lbs. on his back. This done on a few bowls of rice and bean-curd, for a wage of less than 9*d*.

And then, on their arrival, one might have thought that the coolies would have been glad to get to rest; but if, as was often the case where accommodation was limited, I slept in the same house, I found to my annoyance that to retire to bed was far from their thoughts, and that my sleep was often disturbed by the noise they made, as they sat up gambling long past midnight; and yet they would be again on the road before six in the morning, having risen to make up their loads and get their food cooked before five, though I must say that to effect this early start necessitated considerable supervision and early rising on our part, and on that of the Fu-tou, or headman of the gang.

Lao-ho-ku, our first halting-place, is the most important trading centre on the Han river above Hankau, and is well situated, with a river frontage of $2\frac{3}{4}$ miles, giving very good wharf accommodation. Its importance consists in its being at the head of navigation for large junks from Hankau. At Lao-ho-ku the cargoes these junks bring up have to be transhipped into smaller boats, if going up the Han river to southern Shen-si, and also if going up the small tributary to King-tze-kuan; from the latter place it is by mule and camel to Hsian-Fu, the capital of Shen-si, and to Kan-suh.

Goods take from fourteen to twenty-eight days coming up the 300 miles from Hankau. The average depth of water is about $3\frac{1}{3}$ feet, but at low water it is difficult to draw more than 22 inches in the rapids. Boats carrying 20 tons get up to Lao-ho-ku without, as a rule, having to lighten cargo.

It is very unlikely that the Han river will ever lend itself to successful steam navigation for more than 100 miles above Hankau, except in a most favourable state of water. In February we tried to

get a steam-launch at Hankau to take us up quickly, but found that it could not guarantee to go up more than 40 miles in the existing state of water. Goods are distributed from Lao-ho-ku *viâ* Teng-chou to the great northern road into Central China, though the Peking-Hankau railway must now take away a great deal of this traffic from the river.

The six large wholesale firms who deal in foreign cottons here are said to do a business of 10,000,000 taels a year, and there are a number of smaller firms transacting at least an equal amount. There is an enormous trade done in varnish oil, which goes greatly to Japan. There is an immense general trade in every sort of goods. The mer-

SE-CHUAN RIVER BANKS.

chants are mostly from Southern China, are very prosperous, and have splendid guildhalls in the town.

News of the early Japanese victories had reached the place. The inhabitants were strongly pro-Japanese, but were amazed at what the Japanese had accomplished, and said it was no wonder that China had failed to fight them successfully.

The anxiety evinced by the Chinese authorities to avoid any chance of embroiling themselves with foreign nations from any ebullition of excitement on the part of the populace on the outbreak of the war was very marked. Everywhere we went we found proclamations posted by the local authorities to the effect that all subjects of the emperor were expected to behave with the utmost circumspection towards foreigners

in consequence of the troubled times, and that any insult or disrespect to foreign missionaries and travellers would be severely dealt with.

A large building was being erected in Lao-ho-ku, in which the pursuit of Western learning was to be carried on. It was nearly completed, and had doors and windows made in foreign fashion; but, as we found later on in all the places we visited, there was no one in the city capable of imparting instruction.

After Lao-ho-ku, the next place of interest we struck on the Han river was Chun Cho. This is one of the most interesting old places in China, and is entirely different from most cities in which I have been. It is said to have more temples than any city in China, and the foundation of its sanctity to have originated from the time of Cheng-tsu, the third emperor of the Ming dynasty. Its proximity to the sacred mountain of Wu-tai Shan accounts, to a great extent, for its peculiar old-world monastic atmosphere. It is a most delightful sleepy old place, with quite the air of a cathedral city, with its precincts full of votaries, who, on their way to Wu-tai Shan, stop to worship in its temples. It was founded in the Yuen dynasty, but was entirely rebuilt during the Ming dynasty in the reign of Hung-wu. It was early in this dynasty that Peking became the capital under the following circumstances: The second emperor, Hwei-ti, was travelling in the southern part of his empire, when his uncle, Cheng-tsu, improved the opportunity of his absence to raise troops and seize the capital city, Nan-king, and soon after he established his capital at Peking. In spite, however, of his dishonourable conduct towards his nephew, he had a great inclination towards piety, which became so intense that he aspired to become a saint, and most of his time was spent in reciting prayers and doing meritorious acts, in order that he might secure indulgence for his previous misdeeds. Amongst other acts of piety, he used to maintain in his palace thousands of Taoist priests. At last, in a vision, a heavenly deity appeared to him, commanding him that he must avail himself of the first opportunity to do some heavenly work in order to secure the favour of God and to avert his punishment. The deity had the same features as Cheng-tsu. The emperor's flatterers accordingly suggested to him that nothing could be more pleasing to Heaven than to erect a temple, in which a resemblance of this deity should be placed. And soon after this, when visiting the sacred mountain of Wu-tai Shan, he saw beautifully coloured clouds descending from the sky on to Chun Cho, in which place he accordingly built a large temple, and placed therein an image of his celestial visitor, which was modelled on his own likeness, and is to be seen still.

Yun-yang, the next city we came to, is a large city on the left bank of the Han, and is somewhat of a military centre, being the headquarters of the chen-tai, or brigadier-general of the district. This officer was a very fine old warrior of the old school, and had seen fierce fighting against

the Panthay and Kan-suh rebels; his body was covered from head to foot with wounds, and of these he had nearly one hundred, and I almost suspect that at some time he must have been taken prisoner and only saved from death after he had been tortured, though his own history of his wounds by no means tallied with this. From his account, nearly each one had been received in some separate fierce hand-to-hand encounter. He had the fine hearty bearing and manner of the old school, which one finds amongst Chinese veterans of standing and rank. I always like them; they have a bluff geniality and outspokenness one seldom finds in the civil official in China. As a rule, even though their ignorance of foreign methods may be greater than that of the latter, the high military officials are in favour of reform; they see how China has lost all her military power and prestige, and they are anxious for her to regain it, and they recognize that in the existing state of affairs there is no hope for this.

I was so fortunate as to have travelling with me just at this time the Rev. Gilbert Reid, who has had a great experience of dealing with the official classes of China, and who has, in late years, lectured a great deal to the Chinese in various large centres on such subjects as their relations to foreign powers, etc. It was very interesting to find in several of these out-of-the-world places up the Han river the officials at once recognized his name, and had read his lectures in the Chinese vernacular papers issued from Shanghai. At Yun Yang Fu the Taotai, who had been here for twenty years, and was very evidently a man of the old conservative school, referred to his having heard of them and being much interested. This was a great admission for a man like this to make, and showed that there is a great under-current setting in towards reform and a wish for enlightenment. Yun Yang Fu has always borne a bad reputation for its attitude towards foreigners, the latter have several times been expelled by the inhabitants, and it was distinctly one of the most backward cities we came across. However, under the Imperial edict ordering research after Western knowledge, a large building has been set aside as a school for foreign learning to be taught in, although, as in nearly every other place we visited, we found no further progress than this had been made on account of the dearth of qualified teachers.

From Yun Yang Fu I struck into the country south of the Han river, following up the valley of the Ton Ho. These regions between the Han river and the Yang-tze are a mass of mountain ranges, which, considering their barren and sterile appearance, have a wonderfully large population in their small valleys, the latter being under the most careful system of cultivation.

In fact, the population is greater than these tiny little valleys and crevices, containing patches of cultivation almost hidden away from sight, can support, and a large quantity of grain is imported in return

for paper exported, of which great quantities are manufactured. There is also a large export of straw for shoes, which grows all over the hill-sides, as does also rhœa and trees producing Tung oil, and Chi yu varnish, the latter used for oiling umbrellas and oiling waterproof paper, all of which products are exported in considerable quantities, and, where water-transport is available, coal; the mines from which the latter is extracted are near Chu-shan. The rivers, however, are not of much avail. Junks carrying 3 tons can get up the Ton Ho as far as Chu-shan. In low water the rapids present difficulties, and in high water the current is too swift for any greater freights.

I followed up the Ton-ho valley as far as Chu-shan, where I met Captain Mahon, and thence travelled along the overland trade route to Hing-an-Fu, on the Han river. All these valleys are full of coal, and there are great rumours of evidences of copper and silver in paying quantities, and a great deal of attention has lately been paid to this part of China by continental mining engineers.

Some six weeks before our visit two French engineers had been here, and ten months before that a party of three had also visited this place, and since our visit I have been informed that separate parties of Belgian, American, and French engineers have visited these districts. It is to be hoped that those interested in British mining enterprises in China will also investigate into the prospects which these regions may hold out, for there appears to be little doubt but that the prospects of mineral wealth are worthy of their attention, and should the reports of its richness be verified, and the amount of traffic that is likely to arise warrant such an undertaking, the country between Lao-ho-ku and Chu-shan would afford a practicable alignment for a railway line.

There is a very curious tradition about diamonds having at one time been found in these regions and in those of the Chin-ling range, on the north side of the Han, and at Lao-ho-ku we were told that there were families who still had in their possession as heirlooms diamonds which in old days are supposed to have come from these parts, but from what locality is no longer known. A year or two ago one of these men took two of these stones, which had been in his family for generations, to Shanghai, and received 7000 taels for them. We, however, had not the good fortune to find any of these lost diamond mines, and my idea is that the story of their existence in old times may be rather a mythical one.

Hing-an-Fu, which we next made for, is the first large city on the Han, in the province of Shen-si. The present city is on the right bank of the river, on a large flat formed by the old bed of the Han, which has changed its course. The former city, which was in existence before the Tang dynasty, was situated on the left bank.

The Tai-ping rebels carried Hing-an-Fu by assault, and massacred one-half of the population on their way to Han-chung-Fu. There is a

large Mohammedan element in the city, nearly two thousand. They are very easily distinguished, as they have a more swarthy appearance and more marked features than the Chinese.

Mr. Burgess, of the China Inland Mission, who has been here for many years, told me that they often give trouble, as they are very quarrelsome, much given to boasting of their Turkestan origin, and, in spite of the Prophet's injunctions, drink a great deal of wine. This is usually the case with Chinese Mohammedans. Here, and more especially

PAVED ROAD NEAR CHENG-TU.

in Kan-suh, a few of their spiritual teachers keep up their knowledge of Arabic, and are occasionally visited by Arab or Central Asian mullahs, who follow the old Arab trade route by way of Hami, by which the Arabs originally traded and propagated their faith. These mullahs visit every country in the East where the followers of the Prophet are to be found, and keep up the ties of the faithful with Islam. As they often stir up dissatisfaction and foment disturbances against the Chinese authorities, the latter regard them with suspicion, and they

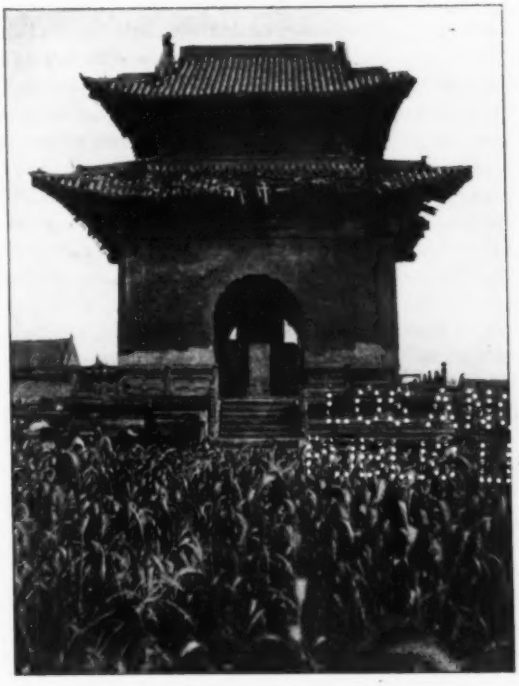
are given short shrift under these circumstances, and are not heard of again. I was told of one of these mullahs who lately in Lan-chon, in Kan-suh, had been seized on in this way, and his co-religionists, fearing his fate was sealed, came to the English mission station and appealed for assistance on the ground that he was a British subject. With some difficulty an interview was obtained, but it was found he spoke no Chinese, only Arabic, but he kept repeating in English the words "Bombay, Calcutta, King Edward," evidently the whole of his English vocabulary, but whose importance in establishing his claim to be a citizen of no mean empire, and of being a subject of the great Kaiser i Hind, whose name even here could protect him, he thoroughly realized. I am glad to say that the magic words enabled him to escape the fate he would doubtless have otherwise suffered.

In spite of the mountainous character of the country around, rice, wheat, oats, barley, beans, and peas are abundant, though opium has taken up much of the good land formerly occupied by wheat and rice. Seven years ago rice is said to have been sold at 8*d.* a bushel, now it is about 2*s.* 8*d.* per bushel. The export of mountain produce is large, and that of a species of mushroom called Erh-tsu, which has reputed qualities of much virtue, is said to amount to 100,000 taels. Hemp to the same value is also exported, and a similar amount of tea. Also ki, or lacquer varnish, is exported in large quantities. An immense quantity of tong yu, or tree-oil, is also exported from the districts around; scores of mills are at work expressing it. There is a large trade done in hides by the Moslem merchants, who ship these down to Hankau. Medicine, opium, and silk are also exported in large quantities. Coal is supplied to all the cities down river, and tons of grass rope and grass sandals are sent up and down river. Most of this trade from Hing-an-Fu goes direct to Lao-ho-ku or Hankau. With high water a junk will travel to Lao-ho-ku in five or six days; eight days is about an average run, and twenty to Hankau. A quick run up from Lao-ho-ku is fourteen to sixteen days. Although, when travelling through the mountain country to the south of this portion of the Han river, one had been surprised that it could support so much population, and that the latter could afford to import food-stuffs, yet when one appreciated the amount of exports collected from similar country around Hing-an Fu and sent down, one quite realized how the imports were easily paid for. That these exports largely exceed the imports is shown by the fact that numerous mao-pan, or cargo boats, are hastily put together to carry cargo as far as Hankau, and on arrival there are broken up and sold as lumber.

The attitude of the people here is not very cordial to foreigners. Friction with Roman Catholic converts has had something to do with this, and in consequence of disturbances which occurred shortly before our arrival, between the latter and a secret society called the River

and Lake Society, troops were called out, and about sixty people were shot down. This episode has by no means lessened the unfavourable feelings with which the Roman Catholic community are regarded.

The country we had so far travelled through for the 300 miles since we had left Chun Cho had proved most mountainous. There is no such feature as any valley, in the sense of valley-bottom land, to the Han river in this part of its course. The river lies between steep hillsides, which often for miles are converted into the precipitous



ANCIENT TABLETS AT CHUN CHO.

walls of gorges, and, except at rare intervals, where an affluent comes in and has formed a small plain of perhaps a couple of miles in breadth, there is no level ground.

The basin of its large affluent the Tou Ho, whose headwaters drain most of the country between the Han river and the Hu-peh portion of the Yang-tze above Ichang, also presents hardly any open country. Little more than a sea of confined ranges can be seen to the south of the Han, and no open valleys run for any distance. Between the Se-chuan

basin affluents and the Han river lie barriers of even more intricate and more barren mountain ranges, which we now proceeded to traverse. At any time these produce barely enough to supply a very scanty population, but three years of scarcity had preceded the present one, so that in these regions we found that we had to carry everything in the way of food for our party, even rice for the coolies. The country people, we found, were in many places subsisting on roots and grass-seeds. We were now in the heart of the Ta-pa-shan ranges which form the north-east boundary of Se-chuan. We have already seen how much difficult mountainous country must be traversed before even this barrier is reached, but when the difficulties of finding a suitable road through this are surmounted, and the hope arises that now only a single dividing range cuts off the Se-chuan basin, it is found that the chief difficulties of the route have still to be overcome before the actual water-parting can be negotiated. For from the main divide are thrown off numerous large offshoots, which often for a long distance run nearly parallel with the latter, forming secondary watersheds, to surmount which is in itself a very difficult task. For an alignment could not be carried along the sides of the tortuous streams which wind their way between the precipitous sharply interlocking spurs of these secondary ranges; and having overcome the difficulties offered by the first or even the second of the latter, it is only to find that there is still another to be crossed, and yet another, before the main divide is attained. These Ta-pa-shan ranges are largely composed of limestone, which is worn away into all sorts of fantastic shapes, whilst sheer-cut precipitous white cliffs, beautifully wooded at their summits, rise majestically above the stream-beds some 1000 feet or more. These streams are for the most part dry, and their beds are full of the most enormous boulders, 10 and 12 feet high, which are carried down into them by the torrential rains, and lie in such numbers so close together, that the coolies who use the stream-beds as routes in the dry season, have cut ladder-like holes in them for their feet, such as might be made to clamber over a wall that stood in the way. Our progress under these circumstances was often slow, and I remember a path of this sort along one stream-bed over which, even without any encumbrances, my guide and myself took four hours to make a distance of 3 miles, whilst our coolies took more than double the time. A peculiarity of this country is the extraordinary way in which streams of good size entirely disappear; they have eaten their way into the limestone by an underground tunnel, and may be found again appearing many miles away. Another feature is that high up there is a great deal of easy valley at the sides of the streams, but as the descent is made, these valleys, instead of opening out further, become more and more contracted until at last they plunge into the most magnificent gorges, hopeless for all purposes of communication.

The Se-chuan side of the watershed affords a more gentle incline towards the northern end of the watershed, but further south, after a high tableland is traversed, there is a sudden plunge down some thousands of feet in a few miles.

After leaving this country, our party proceeded to examine the country immediately south of the Yang-tze and also the eastern corner of Se-chuan, a part of the province hitherto hardly touched on by Europeans; at least, only in one place did we hear of Europeans having previously been seen, and here we were told that thirty years before a party of five or six foreigners had passed through. The only clue we could get as to their nationality was given us by an old man, who, catching sight of rather a loud and gaudy check-pattern of the lining of a mackintosh, said they had all worn clothing of a similar pattern. It seemed to be rather an out-of-the-way part for the British tripper to have penetrated, but I think the evidence pointed to the nationality being British. The people in these places were very pleasant to deal with, and though at first afraid, when once accustomed to our presence, always exhibited a marked kindliness and a desire to make the rough shelters they offered us as agreeable as possible. I was much struck, after my wife had joined me in this mountainous region, by an incident which occurred in a little hamlet where we had put up for the night, and torrents of rain were coming down. We had had assigned for our accommodation what was said to be the best of the half-dozen hovels which composed the hamlet, but as the rain came through the roof on to our bedding in streams, I hunted around for a more watertight house, but was received with the most unwelcome looks, and could not make any arrangement with the owners, and had to abandon the attempt to improve our condition. To my surprise, a few minutes after, we received a smiling deputation of the very householders who had given us such surly looks before. They said that they had since heard that my wife was with the party, and was suffering discomfort, and they hoped we would honour their house, and that their womenfolk were most anxious she should have their best room, and had already made it ready for her occupation. I thought it was a most kindly attention, as it was evidently done out of pure kindliness, and a wish to make things easier for the foreign lady. It is not a country, however, that I can recommend to ladies here to travel in at any time of year, but least of all when the rains are in full vigour. In the next day's march our experience was even worse, as towards the evening we came upon an unbridged torrent in flood; the only ferry-boat had been carried away, and the only accommodation lay on the other side of the river, with the exception of a salt-coolie's inn, which consisted of two rooms built of planks with interspaces of 6 inches or more, and which were grimed with the dirt and smoke of generations of salt-coolies, of whom there were already about twenty in possession. On this occasion we were fortunate enough to

find an old half-ruined Taoist temple to take shelter in. In China it is impossible to use tents, as the traveller, even in an inn, has to close his doors to keep the mob out, but in a tent his life would be unendurable owing to their inquisitiveness. I have had my tent carried off its poles by the pressure of a well-meaning but curious crowd.

Trying as the rains are, they cause the temperature to drop so that one can march with comparative comfort; but later on in July, when there was a long break, the heat marching in the day became most trying to all, and in one march, though only carrying light loads, three coolies dropped down from sunstroke.

The inhabitants of some of these places held some very quaint superstitions. For a long series of marches going through this country we could get no fowls, a great privation in this part of China where no meat is obtainable; we were told that some time before a fowl had scratched a man, and he had died from the effects. A story got about that a dragon had got into the poultry, and they were liable to cause death to their owners. Throughout all the neighbouring districts all the poultry were slaughtered as the story spread, and we had to pay fabulous sums when we came across any, and these were, of course, now in great demand for rearing purposes.

Further on we left the mountain fringe for good, and plunged into the Se-chuan basin. A great deal of this eastern portion has as yet been rarely visited and described. It is probably as rich and densely populated as any part outside the plain of Cheng-tu. Splendid coal is to be found everywhere, and the gunboats who now use it instead of bringing Cardiff coal, which, when imported up the Yang-tze to Chung-king, costs about 120 shillings a ton, say it has a great steaming power. Iron is also found everywhere, but the iron foundries are most primitive. And there is a great prospect of profits before any English firm who will import hoes and other agricultural implements suited to the wants of the people, as there is an enormous demand for these.

As we dropped down on the Se-chuan side of the watershed, we found the gorges were most magnificent, far finer than any of the far-famed Yang-tze gorges. I have never seen anything to equal the grandeur of some of the scenery in these parts.

What enhanced this was the fact that one often approached these gorges from a point where the mountains had opened out for some distance, and a much better panoramic effect was obtained than if one had been buried in the depths of the gorge, as is nearly always the case on the Yang-tze.

Never shall I forget the impression produced as we approached one of these places where brine wells were situated at the entrance to a gorge of the most extraordinary grandeur, and the houses in which the process of salt manufacture was carried on were built on ledges up the steep hillsides. We were coming round a winding path on the open mountain-

side, when it suddenly appeared in front of us, its mighty cliffs rearing themselves up to the sky from the huge black chasm down below. The quaint temples and houses which were built up the steep hillside, which latter appeared very little less precipitous than the cliffs of the gorge, were shrouded in pillars of thick black smoke from the salt brine furnaces, and through a sort of haze the glow of the evening sun threw the blackness of these into still greater relief against the impressive gigantic cliffs. The whole scene gave one the impression that some weird race of giants, who belonged to some other age, had retained their hold on some portion of a former world, of which this was a corner.

BRIDGE AT WANHSIEN.

Altogether this watershed country possesses the most wonderful scenery which could be found anywhere, for further on, as we plunged into the cultivated hills fringing the basin of Se-chuan, we came on miles of wide sloping hillsides with summits rolling well back, covered for miles as far as the eye can reach with myriads of tung trees, which in this spring season were in their full delicate blossom of waxen, faintly tinged petals, whilst down below in the valley lands is poppy for miles and miles in bloom—one valley with nothing but perhaps scarlet flowers, the next all purple, and the next white. Nothing could be more lovely. I foresee the time when these borders of Se-chuan shall have easy access to them established, and may become a resort for

the sightseer seeking beauty to as great an extent as the Japanese scenery is sought at present, and when the inhabitant of Se-chuan may treat him to as cordial a welcome as the wealth-bearing foreigner receives in Japan.

It must not be thought that all the basin has the same charm as this. It is only this wild mountain watershed and the fringe immediately between it and the more cultivated Se-chuan basin scenery that has the wild charm and beauty. The basin itself though very beautiful soon palls on one from its regular cultivation and unvaried regularity of scenery.

We now came on populated parts and large district towns. Even in these out-of-the-way parts we found that a building had been set aside for the pursuit of foreign learning. But some further steps than this will have to be taken, and each district town throughout Se-chuan was sending three students to Japan at the expense of Provincial funds to be educated in foreign learning and modern science. I am afraid as they were only to go for a year that they would hardly acquire a very thorough insight. Japan will undoubtedly supply China with her college educational system and instructors in Western learning. Previous to the present war they had begun to supply the Chinese with military instructors, and three had been sent up to Cheng-tu, the capital of Ssu-chuan. The value the Japanese justly attached to the opening they had thereby effected, is, I think, well shown by the fact that in spite of the strain caused by the present war, which must have made them ill able to spare the services of a single officer, much less ones specially selected for their knowledge and capacity of organization, such as these men would have been, yet they had not been recalled.

That the Japanese will also supply nearly all the civil professors for the new civil colleges, there is also, I think, but little doubt. Apart from the fact that they are in much closer touch with the literature, foibles, and etiquette of the Chinese, and start with a knowledge of the written character which the imported European or American professor would take at least five years to acquire, there is no doubt but that the services of a Japanese professor can be obtained at a rate of salary which would not make it worth the while of a well-qualified European, who can probably obtain double or treble the salary in his own country, to go into exile for. And as China is at present a poor country, for this reason alone she will find that Japan is best suited to supply her wants. That Japan not only will send instructors who understand Chinese foibles and etiquette, and who will be able to adapt themselves to these when necessary, yet at the same time that she will insist upon being recognized on Western lines, was brought home to me by a trifling incident when, in company with Mr. Sly, our acting consul at Chung-king, I called upon the Japanese consul there. As the latter spoke no English and we spoke no Japanese, Chinese was the language used as

an intermediary in which to carry on our conversation, and during the course of the latter, I happened to ask what were the ranks of the Japanese military instructors at Cheng-tu. There appeared to be some difficulty in the Chinese terms being fully comprehended, and an Anglo-Chinese book was produced, and opened at a page on which were the Chinese characters supposed by the distinguished sinologue who had compiled it best to represent the English ranks from full colonel to lieutenant, and which our authorities at Peking are in the habit of accepting as equivalents when issuing a passport to military officers.

The Japanese consul, however, expressed his disapproval after an explanation of their use had been given, and said that, though these terms were used in the Chinese army, none of these characters bore any proper relative significance to those used by foreign military powers, as the officers carrying such titles in the Chinese army had none of the responsibilities or status or consideration given even to a company officer in a European army; and hence the Japanese authorities did not make use of them as proper terms to denote the status of their officers. Turning over the page, he pointed out the characters accepted by the learned author as representing the equivalent for a brigadier-general, and said that, though this appeared to be rather a wide-reaching one for the purpose, it would be the lowest one he would care to use if he wished to convey any proper impression to the Chinese of the status which an officer in the Japanese army was accorded by the authorities of his own country. I think this incident will be appreciated by those British officials who, when travelling in China, may have found that they had been assigned the same status, and were enjoying in the eyes of the Chinese authorities the consideration and respect accorded the leader of the ragged guard, who, on seeing their baggage safely to the next town, would gratefully accept a couple of dollars' tip, the dignity he enjoyed being really little more than that of a corporal.

By June we reached Chung-ching, which city I was visiting for the third time within the past five years, and on each occasion I found it had increased greatly in prosperity. There is an immense trade to this river port, which trade could be increased to an enormous extent were better means of communication once established.

Chung-king is the commercial metropolis of Se-chuan, and the first objective of any railway entering the province must be this city. For it stands at a point on which the network of all the rivers of Se-chuan focus, and to which all their traffic is borne. And although, for commercial purposes, steamers are never likely to be able to navigate the Se-chuan waterways, not even the main stream of the Yang-tze, yet large junks carrying freight of twenty to fifty tons by sailing and tracking can navigate them for some hundreds of miles, and smaller junks

can reach to the confines of the Se-chuan basin, transhipment always taking place at Chung-ching.

Its present great import trade is in Indian cotton yarn, which constitutes over 70 per cent. of the total foreign imports, and even against the competition of the Shanghai and Japanese cotton mills, with their advantages of proximity and abundant labour, India has so far not only held her own, but within the last two years has doubled her imports, and has achieved this under the most harassing restrictions caused by the hazardous means of communication which at present exist.

These have engendered a still more hampering system of credit, the detrimental effects of which, on the purchasing powers of the Se-chuanese consumer, Mr. H. E. Sly, who was acting consul at the time of our visit, has shown most clearly in a recently published report, which will well repay the careful study of those interested in British trade in these parts. Mr. Sly shows how the peculiar system of dealing in merchandise now in existence is due to its delay in transit, and that thereby a great dearth of ready money in circulation amongst the people of the province is caused, hence the larger part of the trade has to be done in kind, and thus the actual value of the products is far greater than the producer himself obtains by their sale.

A railway will remedy this, as by the safety, and regularity, and celerity, and cheapness of transport it will provide, it will facilitate direct interchange, and so cause an increased import of foreign goods, which will come up in three days instead of as many months. Direct intercourse with the purchaser of these goods, who is the seller of his own, will largely divert the profits of barter from the hands of a few wealthy speculators, as at present, into those of the people themselves, and thereby increase their purchasing power, and from this a great increase of trade in British manufactures will result.

At present, of the £2,381,616 sterling of foreign imports which pass through the customs at Chung-ching, £2,150,000, or over 90 per cent., are represented by British textiles, and of these Indian cotton yarn accounts for £1,849,676 sterling.

These figures show the extent to which the Indian Government must be interested in all that pertains to the further development of such a market. It is difficult to place any limitation on the possibilities of expansion this trade alone offers under better conditions of transport. But apart from this cotton yarn trade, which India is peculiarly suited to supply, and in which she does not enter into any harmful competition with our home industries, there is an enormous field for these latter in Se-chuan. For as yet we have only been able to touch on the outskirts of the trade which the province is capable of affording. To Lancashire in cotton drills and shirtings, to Yorkshire in woollens, to Sheffield and Birmingham in machinery and metal work. As the resources of the

province and the purchasing powers of the inhabitants are developed by a railway, an immense trade will spring up in all of these articles. We have in Se-chuan an enormous population, larger than that of the British Islands, a population endowed with the highest intelligence, industry, and thrift, and eager to purchase everything which will add to their comfort and be of use, inhabiting a country rich in natural products, and only requiring to have its latent resources developed to become perhaps the richest in the world; a population requiring all the articles which these great manufacturing centres of ours are striving to find a market for, and are liable to be starved for want of; and a country in which our manufactures have effected such a footing that

THE TA-PA SHAN.

90 per cent of the existing trade belongs to the British Empire, and within the short period of ten years, under the most disadvantageous and hampering conditions, this trade has been able to treble itself, even whilst the latent wealth of the province and the purchasing power of the people has remained undeveloped, due to want of proper communications with the outer world.

In the Se-chuan basin, within an area not exceeding that of Belgium, and with a far greater population, there is not even a single road which will admit of wheeled carriage or of draught animals of any sort being used. In these days of severe industrial competition it seems almost incredible that a country with this enormous population and

natural advantages should have been allowed to remain without a railway, when even the local traffic from town to town would have been sufficient to make one pay. What, then, are the factors which can possibly stand in the way of such a profitable undertaking, and one so desirable to the world at large? It cannot any longer be said that the Chinese are prejudiced as a nation against any sort of railway construction being undertaken in their country, for we have just seen how this great Peking-Hankau line has sprung up and runs through the centre of the great plain of China, and is being eagerly resorted to by the people. And though we may well lament the small extent of British controlled railways in China as compared with those of continental nations, yet it cannot be said that British capital will not come forward. That it is in no way less enterprising than that of other nations may be seen if we look around at what has been done by it elsewhere in China where it has been able to secure an opening, as in the northern railway to Peking and Shan-hai-kuan, where it was the pioneer of railway enterprise on a large scale, and more recently in the Shanghai-Nanking line, whose value the public are now realizing, and also on the Shansi plateau, where, under great difficulties, 700 miles from an ocean port, it has constructed and is successfully running a line of railway connecting the immense Shansi coalfields with the waterways of the Grand Canal.

Neither active hostility on the part of the Chinese, nor want of British enterprise, can therefore be looked upon as the factors of hindering British commercial development in the upper Yang-tze provinces, but there are two obstacles standing in its way which should be carefully considered.

The first of these is, that the Chinese provincial authorities state that they are themselves desirous of undertaking all future railway construction, and of effecting this solely with Chinese capital raised in the provinces concerned, and wholly under Chinese management. Now, no one could in fairness possibly object to this programme being carried out, and as Se-chuan has interest for Great Britain only from the fact of the immense trade that it will one day give us, we as a nation ought to be delighted to see the Chinese themselves doing anything to open up the province in a way which will bring this about speedily. But in the keen modern competition for trade it is almost impossible for any manufacturing nation, least of all for Great Britain, to look on unconcernedly at the indefinite postponement of the development of one of the richest and most densely populated parts of the Earth's surface, a part of China whose trade we already possess so large a proportion of, but which represents only a small fraction of what it is capable of affording us under better communications and modern conditions, and it would appear as if such indefinite postponement is likely to be the only result of provincial action; for though the Chinese say that they

are about to raise six millions sterling in the Hu-peh and Se-chuan provinces for the construction of a railway which will pass through these provinces from Hankau to Cheng-tu, there is no doubt but that neither this sum, nor even any fraction of it worthy of consideration, will be forthcoming under existing conditions.

According to the official announcement which has been made, the railway is to be constructed and managed by the provincial officials, whilst the local magistrates, landholders, and merchants are to be invited to subscribe the money on a four per cent. guarantee, and no foreign assistance is to be accepted. Now, in Se-chuan the ordinary investor does not care to deposit his money even in safe security unless he obtains 12½ per cent. interest; and in China a railway whose financial control was in the hands of the provincial officials would hardly be looked upon as a desirable investment by the astute Chinese investor, who has had an experience of official methods. The necessary amount will therefore never be subscribed, even if six millions were sufficient, but, as a matter of fact, the sum required will be nearer ten millions sterling than six, if the railway is to be carried from Hankau *viâ* Chung-ching to Cheng-tu.

It is quite possible that by offering certain official privileges to investors a comparatively small sum may be raised, perhaps sufficient to keep up an imposing railway bureau in Cheng-tu, and for some time to provide high salaries for a few officials, and even to enable the preliminary survey of a small section of line being undertaken. But such steps as these will be considered by the local authorities to be sufficient, and may be pursued for years without any real progress being made, until the funds are expended and no result attained; and in the mean time the wealth of the province, which should afford such an immense market for our trade, will remain undeveloped. In these days of densely crowded industrial centres, whose populations must have markets for their products, the rest of the world cannot afford to be indifferent to a state of affairs resulting in such a deadlock.

It would be in the best interests, not only of the world at large, but also of China herself, if the Chinese imperial authorities were to fix a limit of time within which the provincial authorities must show evidence of being able to undertake construction, with some hope of the completion of the railway within a reasonable time, or, if not able to do so, that foreign capital should be invited to give the necessary aid. And as British trade represents over 90 per cent. of the foreign trade done in the upper Yang-tze regions, it should appear reasonable to the Chinese Government that when, as will inevitably be the case, foreign assistance is called to aid in the construction of a railway in these regions, British capital should have the preference given to it. But this brings us to the second of the obstacles which stand in the way of British commercial development in Se-chuan. We have with our neighbours the

French an agreement, of which, if a perverted use is made, either nation is likely to be hampered and obstructed in the execution of any enterprise which it endeavours to carry out single-handed in Western China. By it France and England are reciprocally forbidden from gaining any exclusive advantage, privilege, or monopoly in the provinces of Yunnan and Se-chuan. This agreement is one which, if interpreted on a mutual friendly basis, might lead to the most advantageous results accruing to either nation. Unfortunately, there has always been the possibility of international rivalry being so strong, that resort might only be made to an agreement originally intended to be beneficial, when by its instrumentality what are excellent intentions on the part of either nation might be frustrated and rendered null and void in results. Of late, however, between our neighbours and ourselves the promise of a happier era has set in, and we may hope to see the fruits in Western China, and as a contract under which either nation must not enjoy any exclusive advantage cannot be brushed aside to suit the convenience of only one, it becomes necessary, if any progress is to be made, that a *modus operandi* should be established, and as we are the people who will suffer most by any obstruction which will delay the development of the province and the increase of trade which we may legitimately expect to derive therefrom, the sooner we come to a mutual understanding, whilst not endangering any of our interests, the better it will be for these.

It would be preferable to see any railway development wholly British, but if we have to enter into joint co-operation with any nation in these regions, a combination with the French—who so far have not been a formidable rival in our particular industries—would appear to be the one which is likely to be least prejudicial to the interests of our manufacturers. France, with her genius for initiative, has always excelled in the conception of great designs, whereby the whole world has profited; and Great Britain, with her vast commercial undertakings and constructive capacity, has supplied the flow of trade which these designs have required to bring them to fruition. As has been seen, the foreign trade which already exists in the upper Yang-tze regions is almost entirely British. It will be wise for us to consolidate and extend this before more formidable trading competitors than our French neighbours step in and secure a footing in these markets to the detriment of our own industries.

And in entering on any joint enterprise whereby we may be enabled to extend our trade, the fact must never be lost sight of that we are the nation by whose industrial enterprise this existing trade in the upper Yang-tze regions has been built up, and that the immense preponderance of British trade should still give us a controlling voice in any joint foreign enterprise in these regions, the epithet "foreign" being meant to express that of any nation other than of China herself.

Were it not for the trade which British industry has already established, any such project as that which we are considering would not have become practicable, and our neighbours should be the first to recognize the justice of these grounds of our claim to a predominant position in any joint enterprise.

Allusion has already been made to the extent to which our Indian empire is interested in the sea-borne trade of these upper Yang-tze regions, and how India must therefore be particularly concerned in

MODE OF PILGRIM TRANSPORT UP SACRED MOUNTAIN.

anything that may lead to the security of this trade and its expansion. Let us now consider in what other directions India will be affected by the opening up of Se-chuan by a railway entering the province from the lower Yang-tze regions.

At present Indian merchandise from Bombay and Calcutta is shipped to Shanghai, and thence has to be conveyed by steamer 1000 miles up the Yang-tze, twice breaking cargo, finally to be taken up by junk for a perilous voyage of 500 miles or more.

It is very obvious how greatly India must be interested, not only in securing a rapid and safe journey for her merchandise, but also in encouraging and forwarding any sound scheme which may lead to a further development of these markets, the outskirts of which she has so far touched on, as shown by the immense leap this one trade in cotton yarn has taken in the last two years, during which period Indian imports into Se-chuan have exactly doubled.

The purchasing powers of the fifty millions in Se-chuan can be increased to an enormous extent as their opportunities for developing the latent resources of their province and a safer and sure means of transport are afforded, and not only of these fifty, but also of the odd millions who can be reached on the borders of Kan-suh, Tibet, Kwei-chau, and Yun-nan.

One half of the trade which at present goes up the Yang-tze beyond Chung-king is intended for Yun-nan, and, though I have been dealing chiefly with the question of a railway into Se-chuan from the lower Yang-tze, Yun-nan and its development is so connected with this problem that we may for a moment consider a question in which India must eventually be still more interested—that of her direct land communications with Western China and the upper Yang-tze, and how these will be ultimately affected by this railway into Se-chuan from the lower Yang-tze provinces. The railway entering Se-chuan from the lower Yang-tze, as it opens out the province and throws out branches, will undoubtedly lead in time to an extension to meet it being made from Yun-nan Fu, to which place the French railway is now being carried from the gulf of Tongking. This is purely a French line, and will give the French enormous interests in eastern Yun-nan. State support, as well as the natural features of the country, have enabled the French to carry out the construction of this railway. The general trend of the ranges between Yun-nan Fu and Tongking lend themselves to such a line. It is natural that the trade from Eastern Yun-nan should follow not only the easiest route, but what is also the nearest line for communication with the ocean, and this the Tong-king line undoubtedly affords. But it must always be kept in mind that this advantage only applies to Eastern Yun-nan and its capital, Yun-nan Fu, and it is only to the latter that the French can establish by natural advantages any exclusive right of way.

British trade has so far more than held its own in the far richer western portion of the province, and has so far secured the whole of the trade of the important centre of Ta-li Fu and of the populous plains near it. Yun-nan Fu, as the capital of the province and as the centre to which French activity is directed, has received an undue share of attention in itself, and is liable to be considered as the main objective for any line from Burma. As pointed out to us by Major H. R. Davies, to whose careful survey and explorations we are indebted for a thorough

knowledge of Yun-nan, the capital lies in the poorer half of the province, whereas the richest districts in the province are those in the neighbourhood of Ta-li Fu, whose natural source of supply under present conditions is Bhamo. From the commercial centre of these Ta-li Fu districts to Bhamo, with its connections by large river steamers to the ocean, is a distance of 280 miles; whereas from Ta-li Fu to Manhao, the head of navigation for large junks on the Red river trading with Tong-king, is 396 miles; so that with this advantage of proximity

TEMPLE ON HAN RIVER.

to Bhamo, it is only natural that the Western Yun-nan trade should be British.

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But when the French have completed their railway to Yun-nan Fu this favourable state of affairs will cease to exist, as there will then be a distance of only 220 miles between Ta-li Fu and the French railway, as against the 280 miles to Bhamo. Thus the trade of Western Yun-nan will be transferred to the French and the Gulf of Tong-king, and though it may be of only small dimensions at present, it is one capable of great expansion in the future, and one we cannot therefore afford to lose. Therefore, unless we are to sit down quietly and lose the prospects of this great future trade, we must do something at once.

The difficulties of a railway route from Burma through Yun-nan are well known, but though such a line may not enter into the range of practical politics in the immediate present, and does not call for prompt action being taken in the way this line between the lower Yang-tze provinces and Se-chuan does, yet we cannot lose sight of the fact that in this great empire of ours, so dependent on its trade, we must often enter on what may be, in the present, unproductive expenditure to provide for future contingencies. Therefore, after India has developed her internal railways, she may well find it to her interest to extend her trade relations and facilitate them by railway construction from her land frontiers conterminous with those of China. She may not be able to enter on any scheme embracing a railway line through Yun-nan into Se-chuan in its entirety for a long period yet, but she can take steps before it is too late to secure a trade outlet for the future, so as to ensure the full enjoyment of all advantages in the trade of Yun-nan, which province, in the course of time, as it regains its population, which has only temporarily been lost, and as its undoubted mineral wealth is developed, will become one of the most prosperous in China.

A magnificent scheme only proves such when it can be carried out with some great advantage gained beyond that of accomplishing a splendid engineering feat or a hollow political triumph with nothing but empty vainglory resulting. A Burmah-Yang-tze line is, therefore, undoubtedly a project to be carefully weighed over before any step is taken, and if found wanting, to be rejected. But it must be kept in mind that, though the trade offered by Yun-nan may at the present time be but small, it is necessary to look beyond this, and any one who does so, and also studies its past history as well as what its future must bring forth, will see that Yun-nan has enjoyed in the past much richer and more prosperous conditions. With the overflow of excess population from Se-chuan, these conditions will not

only be attained again, but with the spread of modern industrial methods and the development of modern communications, must be far surpassed.

Unless this planet were to stand still these naturally rich provinces must advance with the rest of the world. But Se-chuan must first be opened up from the east, and the increased prosperity which rapid and safe means of communication bring to this province will cause new outlets to be sought, and these will be in the direction of Yun-nan, which by then will have been opened up by the French railway as far as Yun-nan Fu, the capital. The importance of this line from the lower Yang-tze rests not only on its being a sound undertaking financially, but also on the fact that it will become the centre from which will radiate the great system of railways stretching from the Indian ocean to the North China seas, and which will enable us to secure for British manufacturers the market of the millions of people which, under the present limited means of communication, we have barely been able to touch upon.

The information obtained in our journeys may, I hope, form a stepping-stone towards this result. I have not been able to enter so fully into our routes as those interested to-night might have wished; but I hope later on, when it is expedient to do so, that a map may be produced for the *Journal* of the Society in which the knowledge of the basin of Se-chuan and its approaches gained by the labours of the parties to which I have had the honour in the past four years to conduct to these parts will be available; and as over 8000 miles of routes were traversed by trained surveyors and mapped on a scale of 2 miles to the inch and observations systematically taken, it will, I hope, prove a useful addition to our geographical knowledge; and it will be found, I hope, that a key to the problem of opening out these upper Yang-tze regions, so important to our commerce, will have been furnished.

Before the reading of the paper, the PRESIDENT said: The meeting will remember a very interesting paper Colonel Manifold read to us about eighteen months ago. Since that time he has again made a very important journey to the regions of the headwaters of the Yang-tze, of which he will give us an account to-night. I will now ask Colonel Manifold to read his paper.

After the reading of the paper—

Sir GEORGE SCOTT: I have not had the advantage of being over that part of the country about which Colonel Manifold has lectured so very ably and graphically to-night, but I have been on sections of the Yang-tze to which he has referred. Last August I went up from Shanghai to Hankau, and from Hankau I went over the railway line to Peking. At that time, I am sorry to say, the railway was not finished, but from Hankau I took a ticket to Yencheng, a place 20 or 30 miles north of the point Colonel Manifold pointed out to you on the map from which he started for the Han river. From Yencheng I had to go on by construction trains, and a number of bridges had been washed away by heavy rains, so that I was deposited in the middle of some maize-fields some distance from a village. At the village

there were no carts, so I had to adopt the mode of transit for my baggage which Colonel Manifold showed you—I had to take wheelbarrows for a distance of 30 miles to the Yellow river, and from the Yellow river I had to put up with jolting in carts, which was very much worse than the sedan-chairs of which he spoke. They are very tiring, and at the end you generally feel as though you had been run over in a football scrimmage. It took me two months to recover from the bruises. At Hsin Hsiang, a fair-sized town, almost due west of Wei-Hui-Fu, a British line crosses the Pe-han railway, and trains were running backwards and forwards. They do not go far, but eventually I dare say it will connect the German railway with Huai-ching. At that moment it ended at some coal-mines which Mr. Jamieson is digging. Unfortunately, a great deal of water was coming into the mine, and so far as I know they have not got any coal out yet. From Cheng-te to Shun-te Fu, I had to travel by ballast train. What struck me most was the enthusiasm with which the Chinese used the trains. The guards and railway construction people were not people of the most exalted morality, and although the coolies were supposed to ride on the ballast-trucks for nothing, these people all took fees from them, and the way the Chinese dodged round to try and get on the trucks convinced me that a railway anywhere in China is certain to pay. About the middle part of China, the country round about the Han river, I know nothing, but Colonel Manifold has told you as much as any one is likely to know. From the Bhamo side I do know something about the approaches to the Yang-tze river, and I am sorry to say Colonel Manifold is not so enthusiastic about the railway from that side as I should like to have seen him. The whole question of a railway from that side has been prejudiced by Colborne Baber, who said that a railway there would have to be a series of bridges and tunnels. Well, if you start from Bhamo, which was the point Colonel Manifold did start from, you would have to build these bridges and tunnels. But some years ago some one asked, was there not a way round, and in this case there is a way round. Nature has provided us with a geological fault. Colonel Manifold told us that the rivers and the ridges ran due north and south, and so they do in most places, but in one place, directly in a line with Mandalay, there is a curious fault—the line of rocks run due east and west, and up this from Mandalay a railway has been built. This line, however, reminds me rather of the road of which we saw beautiful pictures, built, I think, by the Sechuan men. But it seems to me we are like the Hupeh men in so far as we are faint-hearted, and have not finished the line. The railway so far stops at Lashio, and if it goes no further it will never pay, but if we carry it along this geological fault to China or into China it will be a success. The fault leads us not only to the Salwin river, but it gives us a route up the Nam Ting to the Mekong river watershed. Colonel Manifold referred to Major Davies' journey up there. He was in a hurry to get to Tali-Fu, and therefore he took the most direct line. Captain Watts-Jones, who was killed by the Boxers, went up more or less prospecting for a railway, but he also wanted to go as fast as he could, and so he went the same way, and this line of crossing the Mekong is certainly very difficult. The proper route would be to cross southwards from the Nam Tinl to the Nam Hsunl, down which the Mekong could be easily approached. The country in between is a series of anastomosing streams. The rivers appear and disappear in a most extraordinary way, so that you do not know which way they are going. But in any case a good railway expert is wanted to examine this route, and if once the railway could be got across the Mekong to Ching-Tung, then there is no difficulty whatever in going north towards Tali-Fu, or, better still, to a point halfway between Tali and Yunnan-Fu, whence there is an easy approach to the Yang-tze. I am inclined to think this railway would pay very well. But the Royal Geographical

Society, as a rule, does not care very much to talk about trade or about politics, so I will only say that so far as Colonel Manifold referred to this question I will say ditto to him, and I will put it on the ground which is much more in the way of the Royal Geographical Society—of the ethnological question. The country north of Tali-fu is the place where we shall find, if we ever do find, the solution of a great many of the puzzling questions of the different races who inhabit the frontier hills. We want to find out a great deal more about the Akha, and we want to know about the Lahu. At present the learned authors of the linguistic survey of India, whenever they find one of these tribes of which they do not know much and of which the vocabularies are not very extensive, immediately put it into the Tibeto-Burman class, which is very much what we used to do as boys; if we met a place that looked like a town we put it in Asia Minor, and if it looked like an island we put it in the Ægean sea. I will not further trespass on your time, but I know I shall be expressing your feelings in thanking Colonel Manifold for his very excellent paper.

Mr. Byron Brennan: I think that anybody who has paid attention to the paper which has been read by Colonel Manifold must feel persuaded, if he was not already convinced, that there are great advantages for all concerned, for the province of Se-chuan itself, for all foreign countries which have commercial relations with China, and for those with whose money and by whose energy the great work will be completed, there is a great advantage for all if a railway can be constructed which will link up the province of Se-chuan with China, and thereby with the rest of the world. The wealth of the province and its latent resources have been referred to by every one who has been there, and the easy circumstances of the well-to-do population have been remarked by every observant traveller. I suppose of that population, which is loosely put down at from forty to sixty millions, their only grievance is that they are unable to share the bounteous gifts of Providence with less fortunate people outside. Se-chuan may be reached from two directions, from the east and from the south-west by way of Burma and Tong-king. I think, if only commercial and financial prospects are taken into consideration, there is no question that the first railway must be built by the east, that is reaching Se-chuan by the front door; and what use we make of the back door must be left for future consideration when events have developed. Naturally, the lecturer did not tell us very much about the routes he had followed; but I think we may all take it for granted that there are no insuperable difficulties in constructing a line, and that if we had had the hold on China that we have in India, a line would have been constructed long ago. But it may very well be that there are no serious physical obstacles, and that the railways are sure to come, but that is not all. We have to remember that China is an independent country, that we cannot force railways upon her—at least, England is not the nation to do so—so that any railways in which we have a hand must be constructed with the consent of the Chinese Government. Colonel Manifold has told us that there is one serious obstacle that the provincial authorities have stated their opinion that they would like to provide the money and retain the control of the railways in their own hands. I quite agree with him; there is not the slightest chance of a tithe of the money being found on those conditions. No Chinaman will put money into a concern controlled by Chinese. But if the province is unable to do the work, the central government will then say they must have recourse to foreign capital. But that is not a matter to discuss here. I do not think we may expect much difficulty from the second obstacle which Colonel Manifold mentions—I mean the agreement between England and France whereby both countries are not to seek exclusive advantages or monopolies in the province of Se-chuan or Yun-nan. That must have meant that

neither Government would seek to do so, but not, certainly, that private individuals are debarred from entering into enterprises without going halves with the other side. I think it would be a very good thing if the Chinese Government would institute a railway department worthy of confidence, and one that would give satisfactory guarantees that the money provided by foreigners would be properly and honestly spent. I know of no place in China where such a department would have a better chance of making a beginning and with a greater chance of success than in that region which has formed the subject of Colonel Manifold's very interesting paper.

The PRESIDENT: The meeting has to thank Colonel Manifold for a most interesting and entertaining paper, in which, admirably illustrated as it was, he has given us an idea of that remarkable region which he has explored, many parts of which, I believe, have never before been visited by any European. He has filled our minds with political ideas and ideas respecting the construction of railroads, but yet with very remarkable skill he has never himself gone beyond the bounds of the geographical aspects of these questions. I am sure you will all join with me in passing a very hearty vote of thanks to Colonel Manifold for his very valuable paper.

C. REGINALD ENOCK'S JOURNEYS IN PERU.*

By Sir CLEMENTS R. MARKHAM, K.C.B., President R.G.S.

MR. ENOCK, an observant traveller and enterprising mining engineer, has favoured us with five interesting papers narrating his adventurous journeys in the snowy cordillera to the east of the long lateral valley of Huaylas, in Peru, his experiences in the lofty highlands and on the ice-caps, and his attempted ascent of a virgin Andean peak.

The first paper describes his exploration of a pass over the eastern cordillera; the second narrates a journey in the region where the rivers Marañon and Huaylas take their rise; the third is on the ruins of Huanuco; the fourth is on an upper section of the valley of the Marañon; and the fifth relates Mr. Enock's attempt to ascend the peak of Huascaran.

I have found it necessary to condense them into one paper.

I. *Pass across the Snowy Cordillera.*

On October 3, 1903, an English engineer named C. Reginald Enock left the Peruvian city of Huaraz with the object of exploring a pass in the Cordillera Blanca, or snowy cordillera of the Andes, which bounds the valley of Huaylas, in which Huaraz is situated, to the east.

* Read at the Royal Geographical Society, January 9, 1905. Map, p. 700. In a subsequent number will be published a paper by Mr. Enock on "The Ruins of Huanuco Viejo."

A glance at the map of Peru will render clear the formation of this valley, which is known as the Callejon de Huaylas. It is a lateral valley of the Andes, bounded by lofty mountains on either side, with a river finally breaking through the western or maritime cordillera after a course from south to north, and reaching the Pacific as the Santa. This lateral valley, 80 miles long, is a very remarkable feature of the Andes. The city of Huaraz is 9908 feet above the sea.

On the eastern cordillera, to the north of Huaraz, the magnificent peak of Huascaran, 22,048 feet above the sea, reflects the morning or evening sun in glorious tints, and rises upwards towards the ever-blue heavens in impenetrable majesty—beautiful, solitary, eternal.

Impenetrable, because no human foot has ever pressed its summit. The famous savant and traveller Raimondi attempted its ascent, but without accomplishing it.

The object of Mr. Enock's exploration was to determine the practicability of constructing a mule road to connect Humaraz with other towns on the eastern side of the snowy cordillera, especially Huari and Huantar. This route would lead to a large part of the interior known as the Montaña.

Accompanied by four young Peruvians of Huaraz, a guide, and eight Indians, who carried the baggage and instruments, Mr. Enock ascended a ravine called Quillcay-huanca, and formed his camp at the foot of a glacier which is the source of the Quillcay river. The height was 13,288 feet, the western edge of the perpetual snow-line.

Sleep was continually disturbed by the thundering of the avalanches. Next morning the party ascended the rocky wall on the right-hand side of the ravine, and entered upon the snow-cap.

Here all secured themselves to the rope which had been brought for the purpose, as numerous crevasses were encountered, in many cases invisible owing to the coverings of snow which concealed them. The ascent was gradual, and soon the snow began to fall thickly, which entirely obscured the view. In the face of this the party was brought to a standstill, for in the darkness a false step might have precipitated one and all into a crevasse.

When the sky cleared the party resumed their difficult march, and eventually reached the summit. Here a view was obtained of the eastern side of the cordillera. In front long slopes and sheer descents extended downwards, the former crossed by yawning crevasses of unknown depth, among which there appeared to be no passage. Beneath their feet the snow, heavily fallen during the night on that side of the mountains, lay to such a depth that at every step they were buried to the waist. Above their heads the sun, which for a few brief minutes had appeared, again became obscured by falling snow. "Let us go back," was the cry of Mr. Enock's companions. But to this he opposed a firm negative, determined to complete what had been begun,

and believing that, with calmness and caution, an advance was feasible. Seeing that every minute added to the obscurity owing to the thickly falling snow, he took the guide's place, and, animating the others, they slowly commenced the descent, sinking waist-deep at every step. Progress was slow, laborious, and exceedingly fatiguing.

In spite of all their caution there were some narrow escapes. For instance, in descending a slope Mr. Enock felt that the ground beneath his feet was giving way. It was a crevasse, the bridge over which had broken through. He obtained a momentary glance of the ice-walls below, which extended downwards until lost in obscurity, but, with the quickness of thought, he threw himself backwards at full length on the snow, and slowly retreated, making signs to his followers to do likewise. The remnants of the snow-bridge slowly slid into the abyss, and they sought another way.

Wet, cold, and hungry, their privations were increased by the carelessness of the Indian who carried the basket of provisions and cooking utensils. While descending a slope, Mr. Enock was horrified at the sight of these articles rolling past him. He made a wild grab at the tea-kettle, but missed it, and, together with the provisions, it disappeared into a crevasse. Fortunately none of the party suffered from the dreaded *sorochi*, or mountain sickness.

After reaching the eastern limit of the perpetual snow-line, and regaining the solid rock, the descent was easier. They came to the valley down which the river Pamparaju flows, and passed the night in one of the caves which exist there. An infusion of coca leaves was agreeable and sustaining, while a native remedy (a starchy tuberous root) cured the effects of snow-blindness.

The principal point of geographical interest of the region, apart from the route as a means of communication, is that the summit they crossed is the water-parting of the continent east and west. The waters of the river Quillcay, where the ascent was made, flow to the Pacific ocean; those of the Pamparaju, where the descent was accomplished, flow to the Atlantic. The greatest altitude gained was 16,076 feet. The width of the perpetual snow-cap was about 4 miles. The rock formation of the lower slopes is a hard porphyry, capped higher up, and probably beneath the snow, with a slate, fast disintegrating under the action of the elements.

Not far from the town of Huari the ancient Inca road from Cuzco to Quito passes, and in the town of Chavin, near at hand, is the famous old Inca fortress. Numerous well-carved stones, often built into the walls on modern houses, attest the skill of those ancient workmen.

The coca leaf, as is well known, produces the alkaloid known as cocaine, of which a considerable quantity is manufactured in this valley of the Marañon and exported to Europe. The coca leaf itself is the

Indian's best friend. Provided with a pouch full, and a small gourd of carbonate of lime, the Indian can abstain from food for days together during a long journey without any loss of energy. Mr. Enock found this leaf beneficial in the form of an infusion, and he believes that its use might be advantageously adopted in Europe.

He describes the country east of the snowy cordillera as both magnificent and interesting. Copper, silver, gold, lead, and quicksilver are found in lodes or deposits, and anthracite coal is abundant.

II. *Sources of the Marañon and Huaylas.*

Mr. Enock's next journey was to the headwaters of the river Marañon. There are two streams coming from south and south-west, which unite near the town of Pachas. That from the south is the Marañon proper, flowing from its source in Lake Lauricocha. That from the south-west is the Vizcarra, and has its origin in the cordillera of the Andes near Huarapasca.

Mr. Enock travelled down the valley of the Vizcarra to Huallanca, a small place which is of growing importance owing to mining enterprise and development. In the neighbourhood there are very extensive deposits of anthracite coal, which, in some future time, must cause this region to become important. The coal-seams, in many cases, stand vertically within their enclosing strata, which have been very much upheaved and distorted. They tower up to a height of several hundreds of feet above the river, and lend themselves to economical mining methods.

Leaving the Vizcarra on the west, near its headwaters, Mr. Enock arrived within a short distance of his objective point, Chonta, when a fierce snowstorm overtook him and caused him to lose the track. On many of these mountain uplands, or "punas," there are extensive swamps, and across one of these Mr. Enock's party floundered for hours. Night was upon them. There were no habitations and no fuel in the vicinity, except dried grass. Here they had to camp at a height of 15,748 feet above the sea. The icy blast blew through and through them, and the water poured in beneath the bottom edge of the canvas tent. But the traveller who has chosen the winter for his journeys in the Andes against the advice of his friends must make light of the consequences. Mr. Enock did so. He dug a trench on the upper side of the tent, the snow covered the canvas and afforded protection from the cold, and he succeeded in making some coffee. Three Indians were his only companions during this arduous expedition, and they suffered the hardships they had to encounter without a murmur. Wet to the skin and exhausted with the day's work, they nevertheless made every effort to secure the comfort of their *patron*. Next day all the troubles were forgotten when Mr. Enock examined his concession at Chonta,

which proved to be of great value. It embraced a large area of cinnabar-yielding formation, and he thinks it may prove to be one of the most important quicksilver-mines in the world. The altitude is 15,300 feet above the sea.

From Chonta Mr. Enock obtained a view of the hills which bound Lake Lauricocha, the source of the Amazons, backed by a magnificent range of snow-capped peaks.

From this point his return journey to Huaraz began, crossing the cordillera again by another pass, that of Huarapasca, at a height of 15,666 feet. After encountering a furious gale on the summit, he journeyed onward and downwards. The formation is limestone, and Mr. Enock halted to sketch a huge fossil ammonite, which stands facing the road like a stone covered with an Inca scroll. The number of fossil ammonites at this point is remarkable. The diameter of one he measured was 32 inches across.

There are three cordilleras to be passed by this route, that is to say, three undulations of the cordillera, and after two days' riding the party descended into the plain of Lampas, which is 10 leagues broad, and remarkable for its exceeding flatness. It is of gravel formation, partly auriferous, and on its south-west side is Lake Cono-cocha, the source of the river Huaylas. From this point the road leads down the valley, for 50 miles, to the city of Huaraz.

III. *Ruins of Huanuco.*

Mr. Enock's next journey was to the famous Inca ruins of Huanuco Viejo. They are near the upper course of the Huallaga river, one of the great southern tributaries of the Amazons. The ruins are on the western verge of a level tableland composed of quartzite and limestone conglomerate. The hills bounding its northern and eastern sides are vast cliffs of similar materials. The height above the sea is 11,811 feet.

There are very extensive remains of a once populous town, and ruins of a fortress and a palace. The architectural features which are most noteworthy are the stone doorways. The joints of the stones are so closely fitted that a knife-blade cannot be introduced, some of them monoliths more than 7 feet long.

Mr. Enock gives a detailed and most valuable account of the Huanuco ruins. Very picturesque and impressive, he concludes, was the place as the long shadows fell across the tableland, the sun's disc nearing the western horizon upon the hills which crown the Vizcarra. The clouds, a scarlet curtain of texture fine and filmy, strove as if to hide his exit, and from below, rather than from above, appeared the shades of evening.

Some attraction, born of the influence of the dying day, held me, he

writes, momentarily to the place, contemplating those old sad vestiges of a perished civilization.

IV. *Valley of the Marañon.*

Towards the end of March, 1904, Mr. Enock returned from a fourth expedition, which was undertaken to examine and take possession of some gold and quicksilver concessions, as well as to study the geological structure of the valley of the upper Marañon.

Crossing the cordillera, he reached the town of Huantar, a very primitive place near the river Paccha, a tributary of the Marañon. Higher up the Paccha valley are the ruins of the Inca fortress of Chavin, which are extensive, principally subterraneous, and built of squared stones carefully set. There is a series of small square underground chambers, communicating with each other by passages, and also by curious small horizontal shafts. It is stated that below these chambers there is another similar series. Close to the fortress there is an Inca bridge spanning a mountain stream.

The distance from Chavin to Huaraz, across the cordillera by the pass of Yangshallas, is only about 55 miles; and here the projected Pan-American railway would pass, by means of a tunnel. The formation is limestone, which stands up in enormous vertical strata. Numerous small lakes occur, presenting the appearance of having been artificially dammed up. The embankments are really moraines left by the retiring snow-cap, which has receded very notably during the last century.

Mr. Enock went eastward from the cordillera, and pitched his tent on a green meadow near the river Marañon, which, in this upper part of its course, is small. The valley slopes are cultivated with maize and potatoes, and there are numerous villages on the banks, their white walls and red-tiled roofs giving an air of smiling prosperity. The bridge of Chuquibamba, leading to the Montaña or tropical forests of the interior, is a primitive structure. It consists of logs covered with twigs and soil, at a point where the river is narrowed between perpendicular cliffs to a width of 32 feet.

The river Marañon is famous, at this point, for the occurrence of gold in its bed, and the principal occupation of the inhabitants is gold-washing. Mr. Enock has personally obtained gold-dust and small nuggets from the gravel at the verge, and has purchased nuggets of gold, weighing up to half an ounce, from the Indians. There is not the least doubt that great wealth is contained here. Below the bridge the river widens out into a species of whirlpool, which, according to the natives, contains a vast quantity of gold, deposited by the current.

The geological formation of the valley of the Marañon, in this

region, is a talcose slate occurring in thin bands alternating with quartz. The rocks have been much twisted, folded, and contorted probably by "end pressure," and the quartz may be an after-deposit between the laminæ. On the western summit of the river-valley there is a cap of white sandstone, and on the eastern of red slate-quartz conglomerates.

Leaving the river, Mr. Enock proceeded eastward towards the Montaña, arriving at the lakes of Carpa, only a few miles from the tropical forests of Monzon, where there are several factories for the production of cocaine.

In the neighbourhood of the village of Tantamayu, about 4 leagues from Chuquibamba, there are numerous Inca ruins, including a remarkable row of square towers on the summit of a hill. A little further on the ruined walls and towers of an ancient village are massed on a ridge on the opposite side of the valley. Above rolled the sombre night clouds, beneath were the folds of mist which arose from the Marañon, 6500 feet below—the white fleecy mist which only the mid-day sun dispels.

There is nothing which arrests the attention of the traveller in the Andes more than the peculiar aspect which the long slopes present, due to an ancient cultivation. At first sight he is unable to explain the remarkable rippled appearance, until he sees that it is the result of innumerable terraces which have once been narrow plantations or fields, partly excavated on the upper, and embanked on the outer side. The evidence of a very large ancient population is shown by the fact that, in most of these extensive regions, every possible square foot of ground is so terraced, and has at one time been cultivated, however inaccessible it may appear to be. The very extensive ruins of habitations also bear witness to a very numerous ancient population.

The rapid changes of climate are very marked. The traveller may be under the inclement conditions of the lofty "puna" * in the early morning, whilst in the afternoon he may find himself where oranges and lemons grow. At elevations from 10,000 to 13,000 feet a flora very similar to that of the south of England is encountered, and some of the uplands are very like Devonshire—the same hills and streams, the same moist soft atmosphere, the veils of mist and rushing streams of distant Dartmoor, ferns and nettles, fields carpeted with buttercups in bloom, and violets and stitchwort beneath grey stone walls or on mossy banks. But there is little timber; the *quishuar* † and *quenua* ‡ being the trees that principally predominate.

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* A lofty plateau of the Andes.

† *Buddleia Incana.* ‡ *Polylepis racemosa.*

V. *Ascent of Huascaran.*

The last paper received from Mr. Enock contains the narrative of his attempt to ascend the peak of Huascaran.

He had left the town of Yungay last May, with the object of examining some gold-mines near the base of the snowy cordillera. The peak towered above him, so he resolved to attempt the ascent, and sent back to Yungay for blankets, provisions, blue spectacles, small hatchets, and a stout rope. Guides there were none. The party consisted of Mr. Enock, an Italian, Don Cesar Cisneros (a Peruvian), and five Indians. The way at first lay up comparatively easy slopes and ravines, through thickets of *quenua* and *quishuar* trees, and among flowering shrubs. At 11,400 feet the Italian was too tired to proceed; the rest pushed on.

The slopes for several hundred feet below the perpetual snow-line are steep and bare of vegetation, and covered with loose granite blocks. Cisneros suffered from *sorochi*, but continued manfully upwards. At eleven they reached the snow-line at 14,500 feet, and halted for breakfast. Mr. Enock continued to be absolutely free from *sorochi*, the *chancaca* (cake of brown sugar), eaten at intervals, undoubtedly having a good effect in staving it off.

Continuing the ascent, the snow was soft at first, with a thin crust of harder snow, which just bore the weight of a man if he advanced with care. Cisneros was unable to proceed, and remained behind with an Indian. The other four went on with Mr. Enock; but one of them broke through the crust, and was buried up to his armpits in soft snow. This so terrified the others that they would proceed no further. The aspect of the glaciers beyond was imposing. Fearful precipices were exposed to view, showing where avalanches had fallen, and laying bare vertical sections of the ice-cap, which, in successive layers of different stages of thickness, showed their relative ages. On a distant slope an avalanche fell, and the resounding roar echoed grimly among the high ravines and terraces.

During this portion of the ascent Mr. Enock had hopes of attaining the summit, and he therefore witnessed the timidity of the Indians with disappointment and anger. In vain he offered them rewards; they would not move. He proceeded onwards alone.

On reaching 16,500 feet he was obliged to halt. Before him was a profound crevasse, and he hesitated on the verge. Beyond the twin peaks of Huascaran glistened like purest porcelain in the rays of the afternoon sun. Blue and pearly shadows shaded gently off upon their flanks to meet the green profundities, and sheer below the foamy blanket of the avalanche now lay, the mist of its pulverization still hanging in a faint white curtain near the base. Nearly 6000 feet above the white point of the northernmost peak quivered in the blue heavens, like the gnomon of a sun-dial, along whose sloping side the ascent might be possible.

Mr. Enock resolved to push on alone, crossing the crevasse, and advancing up the ice-cap. But it was only to find another deeper and wider chasm, with others in close proximity. The snow-cap was folded and cracked, but by no means impassable with proper appliances and companions. But to advance alone was to court destruction. He reluctantly decided to return.

The majesty of the vast heights was fascinating. No human foot had pressed those slopes before. He was absolutely the first to have visited the virgin solitudes. Far below the long valley of Huaylas lay, threaded by its river. Not a cloud rested on the twin summits of Huascaran. On their outer sides huge entablatures of snow, vast cornices of unsupported ice, stood out, overhanging the gulf below in fearful equilibrium, and casting sharp shadows on the white façade over which they projected.

He turned very reluctantly, and followed his footprints down again, passed the crevasse, and reached the place where the Indians were waiting for him. Late in the evening the whole party returned to the mine at the base of Huascaran. Mr. Enock was convinced that, with more experienced companions and better equipment, the summit might be reached, and he cherishes the hope of accomplishing the feat himself.

The name of the mountain was given by Raimondi. Its real name is Mata-raju, which means "the double point of snow."

Before the paper, the PRESIDENT said: Mr. Reginald Enock, the author of the paper that is to be read to you this evening, is still travelling in Peru. He is a very intelligent, enterprising young mining engineer, and he has sent us home as many as five papers describing his various journeys in a very interesting part of the Andes of Peru, and also a number of photographs and drawings. One of the papers will be printed in the *Journal*, but it was necessary that I should condense the others for reading this evening.

After the paper, the PRESIDENT said: There are several gentlemen who are interested in this, from a commercial point of view, extremely important part of the Peruvian Andes, and I will ask Mr. Schafer, who has a concession for a railway, to speak.

Mr. SCHAFER: I am sure that, after having heard this interesting paper, you will all be convinced that a matter of great interest would be the building of a railroad in order to reach the very important riches which Mr. Enock has referred to. He has not described the ease with which a railway could be built to the headwaters of the Huaylas or Santa river. But by looking at the map it will be seen that, starting at the Lake of Conococha, the river runs through the town of Huaraz, and breaks through the cordillera below Huaylas at Cañon Pato. It then flows west to a town called Santa. South of Santa is a very important bay, which is known to be the best deep-harbour bay on the west coast. From this bay a railway has already been started some years ago by the Government of Peru, and it was built by the contractor Meiggs. It reaches a place called Suchiman, 30 miles from the bay. From there it could easily be built along the river Santa, passing through a cañon which has been cut by that river, and by a very gradual slope it would reach the town of Caraz and Huaraz, and thus come within easy

reach of the department of Huari, which Mr. Enock has so ably described. It would be the only railway that could be built with easy gradients. All other railroads, to reach this fertile and rich interior, would have to be built along the side of the mountains in zigzag form, and reach altitudes varying from 14,000 to 16,000 feet, whereas this Santa river railway has gradients at the very outset of 2 per cent. It appears to me that Mr. Enock has found some very valuable mines and other concessions in the interior, but they certainly are very inaccessible until this railway has been built, and there are a number of gentlemen here present who will be pleased to hear that it is quite possible that within a very short time the work of building that railroad will commence, and that it will be done with British capital. English capital has not been very enterprising in that part of the world for some years, because Peru has been rather at a discount; but recently, through the interesting papers such as Mr. Enock and others have written, some interest has been taken, and it is believed that a railway built from a good port and up this magnificent valley will be an enterprise which English people will have reason to be proud of. I think there are some engineers present who have been over this route as far as Huaraz, and probably they will be able to give you some information.

Mr. G. ALLEN CRANE: Mr. Schafer has described the route which the railway will take, and I will just add a few words as to the district which it will probably tap. When I made my trip, I started from Chimbote, and followed the valley up as far as a river which is not marked on this map.* I followed the course of this river to a place called Pallasca, 60 miles up the valley, and in that district the natives also wash gold just as Mr. Enock has described that they wash it on the Marañon. In the course of the year they collect a considerable amount. All that country is very highly mineralized, and contains copper as well as gold. Further up the Santa river there are large seams of anthracite and semi-anthracite, and, higher up the mountains, bituminous coal, all of which can be easily transported to the coast when the railway reaches it. From Suchiman, where the railway runs at present, to the beginning of the coal-seams is a distance of about 30 miles, and this part of the railway could be built within a very short time. Coal can then be brought to the coast and used on the steamers, and can also supply all the ports on the west coast of South America. These seams of coal can be traced for 20 miles up the course of the river. The seam runs horizontally, and sometimes there are two or three seams one above the other, varying in thickness from 4 to 20 feet. The cañon that Mr. Schafer has spoken of lies to the north-east of Huaylas, which is marked on the map, and there the coal is of especially good quality for all purposes. Further up the river, at Caraz, is more coal; in fact, the town is built on a coal-seam, which dips under the town and outcrops on the banks of the river. All along both sides in the Cordillera, Negra, and the Cordillera Blanca are silver and copper mines, which at the present moment are unable to be worked. Owing to the lack of transport, it is difficult to get ore down to the coast from the mines, as the only way it can be done is over the rough tracks, carrying the ore on the backs of mules. Still following the valley, the railway would tap the copper region of Aija, which is to the south-west of Huaraz about 20 miles. This is a well-known copper district, and a British company is at present developing a large property there. The terminus of the railway (Recuay) is a mining centre also for copper and silver. Independently of the mineral wealth of that district of Perú, the valley itself is most fertile. The natives grow wheat,

* If you look at the most northerly part of the Santa river, you will see a river flowing into it from the north. This is known as the Chuquicara.

corn, sugar, alfalfa, vegetables, etc., besides all descriptions of fruit; but as they cannot at present get a market for their products, owing to lack of transport facilities, they only produce enough for their own consumption.

The department of Ancachs, through which the railway will run, has a population estimated at over 300,000, so it can be readily seen what a boon the advent of such a line will be to the inhabitants.

Colonel CHURCH: I had not intended to be present this evening, but Peru, from old associations, has such attractions that I was obliged to come. I may say—and perhaps it may be a bold statement—that Peru is just commencing, in fact, is in the infancy of, her industrial development. This evening the paper relates more to this than it does to the geographical features of the country. One statement may be corrected. A very long time ago Padre Samuel Fritz, one of the most famous missionaries of the eastern slope of the Andes, said that the Marañon rises in Lake Lauricocha, about 100 miles north of Lima. But some years ago Antonio Raimondi, of whom you have heard our President speak this evening, made a thorough examination of the source of the Amazon, and found that just after the little stream called the Marañon leaves Lake Lauricocha it is joined by a much longer one called the Nupe, and therefore he makes the Nupe the real source of the Amazon. Now, with reference to industrial development, it may be well to call your attention to the history of Peru. It has had three or four periods, not of industry, not of true production, but a history such as the old Spanish invaders gave to it up to the time of the War of Independence, and that was the enslaving of about nine-tenths of the population that the other tenth might enjoy luxury and prodigality of expenditure in all directions, and absolutely tearing the country to pieces to work its mines that Philip of Spain and Charles II. might make their wars in Europe. After the long War of Independence, which left the country full of civil hatreds and absolutely desolate, the people could scarcely get a living, until the guano deposits, anciently worked by the Incas, came into the European market. Then came the problem of how to spend the money? Europe wanted the guano, and was willing to pay £13, £14, £15 a ton for it, but Peru must have some reason for capitalizing these guano beds with rapidity—some excuse, in fact, for a great deal of plunder. So they projected four or five great railways instead of irrigating the lands of the western slope of the cordillera, and they pushed these railways up the mountains with 4 per cent. gradients and 350 feet radius of curves, until a locomotive could scarcely haul up a paying load. What was the result? That mules and jackasses could compete with, and in fact even to-day I understand these beasts of burden compete in some parts, with the railways of the Peruvian Corporation. So that when I hear of a new railway that is going up the Huaylas valley to develop its coal-mines, its copper, silver, and other minerals, and its agricultural resources, I hope, I sincerely hope, it will be built with gradients and curves that will eliminate the jackass from the transportation problem. After the guano deposits were exhausted, a kindly nature gave them the desert of Tarapaca with its nitrate deposits. But these attracted the attention of their southern neighbour, somewhat more powerful than they were, with the result that by force of arms they disappeared into the treasury of Chili. Now, that was the greatest blessing that ever happened to Peru. Up to the date when she lost her nitrate deposits, Peru scarcely had ever done a day's work; nobody thought of personal labour, everybody lived on the Government, lived on guano, lived on nitrate. The war with Chili left Peru prostrate, stripped of everything by which she had been living, and then came the necessity of taking off their coats and going to work, and right nobly have they assumed the task. They have bequeathed their old prodigal habits to their southern neighbour, who fosters them

by a large export duty on nitrate, while they themselves have set to work over Peru with its vast, almost untold wealth, and are making a brilliant show of it to-day. I know of no country in South America that deserves greater praise than Peru for the struggles which she has been making since she lost Tarapaca. She has adopted a gold currency, based on the English pound sterling, and has had the good sense to create a decimal system of ten soles to the pound, and then a hundred cents to the sole, which makes it easy of calculation, and does not wear a boy's brain out in the learning. Then, too, the aspirations of the statesmen of Peru evidently are to see these railways, which they built by mistake in bad locations, out of their mess, and extend them to the other side of the Andes. They have sent out many exploring expeditions, and projected numerous railways. They employ engineers of a high standard of excellency, and we ought to encourage them in every way we can. I predict that Peru fifty years hence will be yielding more silver, gold, and copper, and all agricultural products than ever she produced in the time of the viceroys. When Krupp established his works, which have grown to be the pride of the German empire, it is said that he wrote upon the doorway of his humble cottage, "If work bring blessing, then is labour prayer." Peru also seems to have inscribed this motto upon the gateway to her future.

Mr. LEMBCKE: With the courtesy of Sir Clements Markham, you have heard the interesting paper sent by Mr. Enock. I have had the advantage of meeting Mr. Enock out there. He has set an example of British pluck and energy, and his paper quite confirms what I say. In fact, this evening I believe the paper has been more or less from a scientific and historical point of view than geographical, and although there are a good many persons in this room who know a good deal of Peru, I believe there is still much to study. The position of Peru is being developed in a most interesting way. Surveys have been made for the purpose of establishing communication between the Pacific ocean and the majestic system of river navigation of the interior. It may be stated that about 20,000 miles of navigable river exists. A railway is going to be built from one of the northern ports of the Republic towards the nearest navigable river, and I believe once the Panama canal is opened and this railway built, there will be no other country more attractive for emigration than Peru. As has been said to-night, the country produces all the products known. I seize with pleasure this opportunity to thank Sir Clements Markham as the President of the Society, and personally for all the kindness he has bestowed on my country, and I say the same of Colonel Church for the kind words he has spoken. That is all I have to say.

The PRESIDENT: I should like Sir Thomas Holdich to draw a parallel between the Patagonian and the Chilian Andes and the cordilleras nearer the equator, in a few words.

Sir THOMAS HOLDICH: I regret very much that my travels have never carried me quite so far as Peru, so that I am unable to speak from personal experience. But there were one or two points certainly in Mr. Enock's paper which attracted my attention, particularly with reference to the climatic conditions of that country, as evidenced by the desiccation which is now prevailing there. It seems that there is very little difference between the Andes of the north, the Peruvian Andes, and the Andes of the south in this particular. Everywhere we find precisely the same evidence of receding snowfields and the gradual diminution of glaciers; and this does not prevail only, as you probably know, in America, but it would appear that this channel that we have heard of to-night is but one link in a long chain of evidence pointing to a general drying-up of the whole of the northern hemisphere. And this to me makes it all the more astonishing that there should have been a race of people living in Peru, about whom we have heard

a little to-night, who have left such evidences of their remarkable ingenuity and their great strength as builders, but of whom otherwise we know very little; that such a people should have been at the zenith of their power at the time when the climatic conditions of that country must have been severer certainly than they are at present. It would interest us very much to know, I think—possibly our President can tell us—who are the lineal successors of those people in South America. It is a curious fact that they show, in their remarkable capacity for developing agriculture by means of irrigation in almost impossible places, a great similarity to certain Asiatic races, who have, through all history, evidenced the same capacity. We know that Chinese, Afghans, and Persians alike, all of them, could teach us more than we know at present about the art of irrigation; and the Incas seem to have been quite as much masters of that subject as the Eastern nations, but we find no sort of evidence of the same capacity amongst any of the races of Africa. Colonel Church has favoured us with something of the recent history of Peru; but his history did not carry him far enough back to tell us who we might expect to represent the race of Incas at the present time in the American continent. I know something of the Araucanians of Chili, and something of the Indian people on the Argentine side of the Andes, but amongst them all, there are no people who could ever have risen to such heights of civilization. They are incapable of developing such intelligence as has been shown by those who built the wonderful fortresses and buildings of which you have seen pictures to-night. The Incas seem absolutely to have disappeared. There is one other little point which Colonel Church made as regards Peru. He said that the loss of the nitrate fields was the making of that country, or something to that effect, I think. He will not be surprised to hear that that sentiment is echoed further south. I have heard it said by Chilian gentlemen of light and leading, that the worst thing that ever happened to their country was the acquisition of those same nitrate fields. "We were once," said an eminent statesman to me—"we were once poor, but honest; now we are a little better off, but our political honesty is not so certain." It is a curious fact, perhaps, that what would be reckoned by the world in general as the acquisition of wealth should have led to such results. As regards the extraordinary amount of mineral wealth to which Mr. Enock has pointed as existing in those mountains, we see that the development of it entirely depends on communications being opened up. That, I may say, is precisely the same all through the more southern countries of Chili and Argentina. Communication and the means of transporting material is what they all cry out for. I am surprised to hear what Colonel Church has said about a certain railway of Peru. But I think we may assume that railways with which the jackass can compete are not likely to be built in future in the South American continent, and it is the development of such communication which will undoubtedly lead to the development of the wealth of these countries. But before they can build their railways it is necessary that they should know their country, and that, whether we deal with Peru or Argentina or Chili—that is, I think, really the great want in their programme. They are ready to carry out their public works before they know their geographical conditions. And so we come back to the same old tale, that it is necessary to begin with maps and map-making and scientific explorations. In future, I hope those who leave this country, whether it is for exploiting mineral wealth or any other purpose, will carry with them both the knowledge and the means necessary for adding generally to our geographical information.

Sir CLEMENTS MARKHAM: I am afraid that at this hour of the evening I cannot be expected to enter into any question in regard to the supposed disappearance

of the Inca race; but I may say that my own conviction, telling it you very briefly, is that there was a great monolithic-building people in far distant ages who created a vast empire, that there intervened a very long period, that some of the old race rose again, gained power, and that the modern history of the Incas is the history of a higher race, which, I believe, came from the far south—of a higher race ruling very populous and inferior tribes. The Inca people have by no means disappeared. But, to return to geography, I wish to point out to you what a very remarkable feature of the Andes this long natural valley presents. On one side of it you have what is called the black cordillera, not rising so high as the snow limit, but I believe that in the mines of that black cordillera you would find the water frozen to a considerable depth. And there is another feature which I am given to understand is met with in this long lateral valley, which is that the snow-level on the western side is much lower than in any other part of the equatorial Andes, and this is accounted for by the fact that the black cordilleras in this part, which is nearly 100 miles long, is unbroken by any river. There is no opening in it, and the consequence is, no warmth comes up from the coast, which is the case in other parts of the Andes, and therefore the snow-level on the opposite line of mountains is lower than in any other part of the equatorial Andes. I cannot help wishing, after listening to what has been said, about this famous range of mountains, that we could institute a close and thorough investigation into the Andean system; that we could tell off, say, five or six of our most eminent geographers to undertake certain parts of the Andes, to examine their history and all that is known about them, and to explain to us fully the system in each section that they may undertake. I would take first, say, from the equator to the river Santa; then this part that we have been considering to-night, from the river Santa to the north of Cerro Pasco; next the division from Cerro Pasco to Vilcañota. Another geographer might undertake the basin of Lake Titicaca; and then we should call upon Sir Thomas Holdich to take the rest of the Andes down to Graham Land. I shall try in the future to see whether such a geographical investigation cannot be organized. But we must now pass a cordial vote of thanks to this enterprising young mining engineer, Mr. Enock, for the valuable communications he has been so good as to send us, and for the photographs and drawing which accompany them, and which will all be printed more fully in the *Journal*.

THE IDEAL TOPOGRAPHICAL MAP.*

By Major C. F. CLOSE, C.M.G., R.E.

THE topographical maps considered in the following brief paper are those of which the scales vary from $\frac{1}{25000}$ to $\frac{1}{250000}$, or roughly, from 2 inches to 1 mile to 4 miles to 1 inch. And it is not proposed to discuss field precedure or survey methods, but only to consider the printed map.

A topographical map should possess the following qualities:—

1. All the information which it presents should be accurate.
2. It should present as much information as possible.
3. The information should be presented as intelligibly as possible.

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* Research Department, December 15, 1904.

The first quality, that of *accuracy*, mainly depends upon the methods used in the field, and in this respect the government maps of most civilized countries can hardly be improved upon. The point is, moreover, one upon which all are agreed, *i.e.* that the field methods must be such that there shall be no plotable error on the printed map. But when we come to conditions 2 and 3, we find some divergence of opinion and practice.

The *amount of information* which can be shown and the selection of the information to be shown are two aspects of the same question. The insertion of unnecessary matter may harm a map considerably; as instances of this we have the parish boundaries on the Ordnance Survey engraved 1-inch, and the signs for cultivation on the Spanish $\frac{1}{50000}$. But the opposite defect is far more common, viz. the omission of useful matter. The most common fault, perhaps, is the want of numbered heights, and the next most common fault is insufficiency of names. As illustrations of the former defect may be quoted some Indian topographical maps, on which an abundance of heights are shown on the tops of the hills and very few in the valleys. Another common omission is that of essential details in the hill features, caused by a too rough generalization in the process of reduction from a larger scale.

Another defect, frequently met with in maps on scales of $\frac{1}{125000}$ and smaller, is the omission of minor roads and tracks. This is sometimes a serious mistake. It is often better to crowd the sheet with all the roads there are, rather than produce an easily read, simple, but misleading map. It is, however, clear that the whole matter of the selection of information to be shown on a map is mainly conditioned by two factors —the scale of the map and the character of the country; a statement which may be put in the form of a truism, viz. that, given the amount of information required, the scale of the map will depend upon the closeness of the detail. Thus, a 2-inch scale for Jersey is equivalent to a 1-inch for Kent, a $\frac{1}{2}$-inch for South Africa, or a $\frac{1}{4}$-inch for certain regions in tropical Africa.

It is, perhaps, possible that a class of map might be devised which would show the main features at a glance, and the minor features by means of a magnifying-glass. If we imagine a glass to be used with a power of 2, we could put as much information on a $\frac{1}{2}$-inch map as we now find on a 1-inch map. There would certainly be great difficulties in printing such maps in colour, and simple reduction will not produce the required effect. But, though the attempt might result in failure, it would be worth making. From an army point of view, anything which reduces the bulk of the maps which have to be distributed and carried is to be encouraged.

Almost all Government maps are published with wide margins. These margins are only useful for holding the map by. They might be utilized for presenting additional information. This might conveniently

take the form of photographs likely to assist in conveying clear ideas of the surface features, especially of the vegetation, or of special objects and landmarks likely to help in identifying positions. Engraved views have long been the accompaniment of the Admiralty charts, and the same principle might usefully be adopted for topographical maps. It is, of course, not suggested that a map should be garnished with photographic "tit-bits" of local scenery. No photograph should be printed which is not typical and characteristic, or likely to be useful to a traveller. The photographs would be printed from "process" plates.

The quality of *intelligibility* depends more upon the use of colour than upon anything else. It may be taken as generally accepted that a topographical map should be printed in colours; and, further, the following colours are almost universally employed:—

Blue for water, green for woods, brown for contours, and black for lettering and for the graticule. Shades of brown or grey are commonly used for the representation of hill features on the layer system.

Other matters which affect the intelligibility of a map are—

The shading of the hill features.
The contour interval.
The lettering.
The bearing of the edges.
The conventional signs.

Unless the contours are very close together, the addition of *shade* much increases the legibility of a map. (Vertical hachures do not combine very satisfactorily with contours.) The depth of the shade should vary with the steepness of the slope, and should not depend on any imaginary direction of the incident light.

Examples of the combination of contours and vertical hachures are the Ordnance Survey 1-inch, the German $\frac{1}{100000}$. Examples of the combination of contours and shade, depending on an imaginary direction of the incident light, are the French colonial $\frac{1}{50000}$ and an edition of the Swiss $\frac{1}{50000}$. There is no satisfactory example of the best system, *i.e.* the combination of contours and shade varying with the steepness of the slope.

As regards *contour interval*, the following table will serve to give an idea of what may be considered the normal contour interval. The number in the right-hand column is found by multiplying the contour interval in feet by the scale in inches to the mile.

TABLE OF EQUIVALENT CONTOUR INTERVALS.

	Equivalent in feet on a scale of 1 inch to 1 mile.
The United Kingdom, 1 inch to 1 mile	100
" " ½ " 1 "	50
Ordnance Survey colonial maps	50

		Equivalent in feet on a scale of 1 inch to 1 mile.
France	$\frac{1}{25000}$	52
„ colonial	$\frac{1}{50000}$	41
Germany, Prussia ...	$\frac{1}{25000}$	41
„ Baden		
„ Bavaria	$\frac{1}{25000}$	81
„ Wurtemberg		
Italy	$\frac{1}{50000}$	20
„	$\frac{1}{100000}$	102
Spain	$\frac{1}{50000}$	81
United States	$\frac{1}{62500}$	50
„ „	„	20
	Mean	57

We may therefore say that the weight of authority is in favour of a contour interval of about 50 feet for a scale of 1 inch to 1 mile, and for other scales in inverse proportions; thus, 100 feet for a $\frac{1}{2}$-inch map, 200 feet for a $\frac{1}{4}$-inch map, and so on.

A similar result would have been arrived at on the merits of the case. Every one who uses the 1-inch Ordnance map knows that the contours are not sufficiently close to show the hill features clearly in ordinary country. It requires a very steep slope for contours at such a wide interval to attract the attention they should.

This rule need not be considered as applying to very mountainous countries, such as Switzerland. The Swiss Federal maps have the following intervals:—

$\frac{1}{25000}$	...	...	10	metres,	equivalent to	82	feet for a 1-inch scale.
$\frac{1}{50000}$	...	...	30	„	„	123	„ 1 „

Lettering.—Nothing has so far equalled engraving on copper for clearness. Transfers from copper to stone or zinc give results nearly as good. Next to these comes handwriting on stone or zinc, or heliozincographic prints from manuscript; and the worst method of all is typing. This remark about lettering applies also to contour and detail; if fine work is required, it is best to engrave on copper for subsequent transfer to stone.

The Bearing of the Right and Left Edges of a Map.—It is of considerable assistance, in using a map, if the right and left edges are north-and-south lines, *i.e.* the map should be bounded by meridians. Many national maps fail in this respect; for instance, the Ordnance 1-inch, $\frac{1}{2}$-inch and $\frac{1}{4}$-inch maps are truly rectangular in shape, and the edges are not meridians. In the extreme eastern and western sheets the inclination of the edges to the true north line amounts to about 4°. The same defect occurs in other national maps.

Conventional Signs are undoubtedly an evil, but they cannot be dispensed with entirely. On certain foreign maps (for instance, some French maps) they are far too numerous. As a general rule, the more pictorial a conventional sign is the better. Thus, a windmill should

look like a windmill, and a wind-pump like a wind-pump. Railways should be given cross-bars. The different classes of roads should be distinguished conventionally.

Minor matters affecting the usefulness of a map may be briefly mentioned. The scale, even when metric scales are used, should be expressed in terms of two units—one on the map, one on the ground. Thus in addition to the statement that the scale is $\frac{1}{100000}$, should be added the words, "1 centimetre to 1 kilometre." When there is any chance of a colony adopting the metric system, the American compromise $\frac{1}{62500}$ should be used instead of 1 inch to 1 mile, and $\frac{1}{125000}$ instead of $\frac{1}{2}$ inch. The magnetic declination should be mentioned for the date of publication, and its annual variation given.

A map should be of moderate size, about 18 inches square, and when intended for use out-of-doors, should be mounted on linen and folded. The Ordnance coloured 1-inch maps are very convenient in these respects.

If the various national maps are criticized on these lines, they can be arranged in groups somewhat as below—

First-class maps—Ordnance Survey, coloured 1-inch.
Swiss, $\frac{1}{50000}$.
French colonial, $\frac{1}{50000}$.
United States, $\frac{1}{62500}$.

Second-class maps—German, $\frac{1}{100000}$.
German, $\frac{1}{25000}$.
Spanish, $\frac{1}{50000}$.
Russian, $\frac{1}{126000}$ (Balkan peninsula).
French, "Carte Vicinale."
French, $\frac{1}{80000}$.

Also Austrian, Italian, Danish, Belgian, and Roumanian maps.

It is not intended to imply that the above is an exact classification; such an arrangement must depend a good deal on individual taste and preference. Indian maps, of which the field work is so admirable, would, on account of the roughness of the reproduction, occupy a place below all those quoted above.

It is clear that, as the field of exploration narrows, this Society must devote an increasing amount of attention to mapping and topography as opposed to sketching and exploration. We should have our own standard of excellence in cartography, and the standard should be a high one. It is suggested that the Research Committee should recommend to the Council the expenditure of a sum not exceeding £100 in the production of a topographical map of a high degree of excellence, to serve as a guide for, and be used as a standard by, the Society.* This

* Better still would be a series of maps on the same scale depicting the same tract of country in various styles and on different systems.

typical map would be most useful in the settlement of cartographical questions which arise in all parts of the Empire—such questions, for instance, as were discussed at the recent Survey Congress in South Africa, or which arose in connection with the proposed Survey of Canada.

It would also serve as a standard for candidates for the Society's diploma.

Colonel JOHNSTON: I think Major Close's paper has been an excellent one. It deals in minute detail with a large number of more or less matters of opinion, and on the whole, I think, very fairly and very well, but there are a few points on which I do not quite agree.

In the first place, he mentions it as a very common fault that maps should show too little detail, too few names, and so on. My own feeling is that, as a general rule, the tendency is rather the other way. Of course, I quite admit some maps do show very little detail, but on the smaller-scale maps, reproduced by reduction from the larger scales, the tendency is to try to cram into the smaller scales everything on the larger. In entering this room I noticed some Japanese maps which exemplify this tendency; the $\frac{1}{200000}$ is a well-executed map, but on the smaller-scale map, $\frac{1}{1000000}$ I think, reduced from it the names are too numerous. Again, although hill features are often omitted, it is a common thing, in the case of engraved maps, to find small features over-shown, with the result that the main features are not brought out so thoroughly as they might be.

With regard to the proposal of Major Close about having pictures on the margins, it appears to me the main object of margins is to make the map look better. It is more or less a matter of opinion, but if you have pictures on the margins you rather do away with that. I suggest it would be better to cut the margins off if they are not needed for their present purpose.

As regards the question of colouring maps, I quite agree that for utilitarian purposes the introduction of colour has made a great improvement, and it is now very generally adopted; but I would certainly hardly like to rule out the black and white map so completely as Major Close has done. The Swiss Dufour atlas is probably as beautiful a specimen of map-making as you could find anywhere. Some of the 1-inch Ordnance sheets are also very good specimens, and I should hardly like to have them entirely put out of court. The Swiss, of course, as we know, have gone to colour printing, and their $\frac{1}{50000}$ is a very good example of colour-printing, but hardly so beautiful a map as the Dufour atlas.

I don't quite agree with Major Close when he says the depth of shade should vary with the steepness of the slope. The range that one can get between the darkest possible representation of hills and the lightest is hardly enough to cover any except very great differences of slopes, and my belief is that the best method of representation is contours, combined with shading as shown in the present Ordnance Survey 2-mile maps.

I quite agree when he says contours on the 1-inch Survey maps are not sufficiently close for topographical maps on that scale. It would be much better if they had been at 50 feet instead of 100. Unfortunately, the Survey contours are ascertained with great accuracy at great expense, and I am afraid the cost of the additional contours which he would like to have, and which I should very much like to see on the maps, would be prohibitive.

With regard to the lettering, I agree that good writing is better than typing, but I am afraid I am not prepared to condemn typing in the way he does. As

a matter of fact, nothing comes up to really good writing, especially when the writing is small. The larger the character the better typing compares with writing. When you come to maps reduced by photographic means, I believe typing is as good as any means that can be employed. First-class writers are not very easy to get, and the advantage of typing is that you get uniformity, which you cannot get in writing.

Major Close also mentions that he considers maps intended for use out-of-doors should be mounted on linen and folded. Well, I agree as to their being folded, but as regards being mounted on linen I am not quite so clear. We have introduced recently in the Ordnance Survey a new method of folding, and my belief is that unmounted maps folded in this way are almost better than maps that are mounted. They take up less room, they don't go at the edges, and any part of the map can be read without unfolding the whole. Therefore in their case I don't think there is any advantage, except for very rough work, in mounting on linen. If you wish to get an ideal map for working in the roughest weather possible, I think the only thing is to mount in sections or print on Japanese paper and waterproof. The latter is a beautiful printing paper, and is practically untearable, but it takes wet badly. If you waterproof it, the objection as to its suffering in wet disappears, and you get what I consider a very good map, but unfortunately a rather expensive one. We prepared in this way a number of maps for the manœuvres two years ago, where they had a good deal of wet, and I believe they answered very well.

As regards Major Close's suggestion that the Royal Geographical Society should give a sum of £100 for experiments, I cannot agree; I think the Royal Geographical Society can find better means of spending its money. I think you can safely say that all persons and firms making maps and dealing with them are doing all they can to improve the methods of reproduction, and I do not think the offer of £100 would do very much to further improvements. Moreover, I consider a map must be designed very largely with reference to the kind of country which it is to represent. For instance, I do not consider the style suited for a closely populated country like England would be suitable for a hilly and sparsely populated country like South Africa. To take one example, you find in the American methods a beautiful sample of map where ground forms are shown by close contouring, the same as in the Japanese maps. If you come to a country like Holland, I don't think that would answer as well. I think discussion is likely to do as much good as making experimental maps, and that the Royal Geographical Society would not benefit cartography by trying to lay down a standard. If the Royal Geographical Society take a different view of the matter, the proper authorities will probably have no objection to the experiment suggested on the map of Jersey or St. Helens.

For obvious reasons, I have referred mostly to points on which I differ from Major Close; but while I differ on a few points, I agree in many, and consider that his paper is a most valuable one.

Major Hills: I should like to offer a few remarks on the very excellent paper we have had. I may, first of all, express my agreement with most of the points advanced by Major Close, and our differences are only in very minor points. He says, first of all, in speaking of the accuracy of a map, that all details should be accurate. It would be rather an interesting thing to discuss how we are to distinguish between the accurate and the inaccurate details of a map, because, of course, when we are dealing with maps produced from organized surveys, there is no want of accuracy; still, a large number of the maps we have to deal with are not so produced, and it would be useful if we could get any idea—I have never heard of any practical suggestion—as to some convenient method of

distinguishing what is absolutely fixed and what only depends upon inaccurate or hearsay evidence. The point raised by Major Close about the heights only being shown at the tops of the hills had not occurred to me before, but certainly it seems an extremely common defect. Of course, when one thinks of it, the heights of the valleys are just as important. The omission of essential details in hill features, caused by undue generalization in reduction, seems to me rather a survey question—that is to say, what it means is that it is of the utmost importance that the original survey should be made on the same scale as the final map; in other words, any generalization should be made, not by a draftsman, but by a man who has actually seen the ground and knows it. I don't think I can follow Major Close in his suggestion to print the minor details of a map so that it could be read through a magnifying-glass. It would be quite possible, of course, to reduce a map to such an extent so that it could only be read by a magnifier, and if on any occasion where lightness of transportation was of very great importance, it might be quite possible to make a map by photographic reduction which could be only used by using a magnifier of the power of, say, 10. But maps can now be produced so light, especially with these specimens Colonel Johnson has shown, that really the question of weight is not such a very important one. The suggestion to print photographs on the margin does not seem to me to be a very practical one. Major Close talks of the Admiralty charts, but I think he overlooks the fundamental difference that in the chart the important thing for the mariner to see is the appearance of a certain sea-port or headland from the sea. There is nothing equivalent to that in a map covering an ordinary area of land. If anything were to be put in the margin, it might possibly be plans of the towns, which must be shown in a very conventional way on a small scale. The representation of hills is the subject which will invoke most discussion, and it is very difficult to get any agreement on the question, but I think we may agree with Major Close that the combination of hachures with contours is not a good one. I think we may say that in the 1-inch Ordnance Survey coloured sheets the hachures really add nothing to the legibility of the map. I am not quite certain whether I agree with Major Close about whether the shade should follow the slope or whether it should be a conventional one. I should like to see his specimen-map first. One very important point is a practical question which I should like to ask practical people, and that is as regards the method of shading, the actual method by which the shading is to be drawn on the map. I should like to ask Colonel Johnson about that particularly. Of course, in the old days, it used to be drawn on a stone direct by the draftsman, and it was quite a laborious process. Now, on the half-inch Ordnance Survey maps, it is done with a process block from a brush original; but I cannot admit that the shading on the half-inch Ordnance Survey maps is sufficient to add to the legibility of the map. For instance, look at that map of North Wales, which is, as we know, a mountainous and diversified country. Seen from a little distance, the shading only gives the appearance of a flat tint with a few dark patches; it does not really show up the features of the ground, which is the only justification for adding the shading. The St. Helena map is quite a different sort of example. Looking at that from a distance, it shows up the main features of the ground very well. The suggestion of Major Close, that the Society should undertake the production of a model map, seems to me a very good one. But there is so much difference of opinion that I think it would be hardly sufficient for the Society to produce one map; it would have to produce five or six in different styles, and then let us see them, and we could have another discussion on the subject.

Mr. Douglas Freshfield: I feel as a mere amateur some diffidence in

speaking in the presence of so many professional map-makers. My remarks will not be in the sense of criticism, but mainly in the sense of appreciation of the excellent work done by the Survey. I think the Society may fairly congratulate itself on the adoption of a method it strenuously advocated—the use of colours. I do not say the universal use, because I entirely agree with the Director of Surveys on this point. I am sure that the new maps will be appreciated by the public. With regard to the question of how contoured maps should be coloured, whether the depth of the shade should correspond with the steepness of the slope, I cannot agree with Major Close. About fifteen years ago a new issue of beautifully contoured maps, called the Siegfried Atlas, was made in Switzerland. It did not give satisfaction; it was found that the public did not read it easily, and various experiments were made, of which I see one here, with a view to making the contoured maps picturesque by colouring them. From my point of view, contours give the kind of information we want for scientific use, and you put in the colouring for another purpose—to enable the average middle-class man to read the map easily. The preferable method, therefore, is that which best secures this end. I confess that until I have seen a satisfactory map produced in the way Major Close suggests, I shall lean to the artistic mode of colouring, which is intended, not to repeat, but to supplement the information which is adequately given by the contour. I feel some doubt as to the desirability of what has lately been done in one of our Ordnance maps in colouring the woods green. It may be valuable for military purposes, but for general purposes, I think it rather destroys the picturesque legibility of the map; it makes it look spotty at a distance, and, so far as I can judge, you only get approximate accuracy with regard to the woods. That may be partly owing to the constant destruction of woods. With regard to what is said about the quantity of names, I think there is another still more important question, and that is their selection. I know selection is difficult, and I appreciate the pains taken with regard to the retention of characteristic names. Then with regard to the distinction of roads, I notice in the new maps they are divided into three classes. I am curious to know what principle this classification is based on. In France the first-class road would be the Route Nationale, the second would be the Route Departmentale, and the third the Route Vicinale. But I cannot make out on what principle it is done in England.* In the old maps the distinction between roads was one of the greatest defects; the new maps are improved. Again, I do not know whether I am quite in order in mentioning it here, but I cannot help feeling, as we are met to discuss maps, that we ought not to pass without mention their defective distribution. The clumsy and unpractical way in which the Post Office has taken in hand the distribution of Ordnance Maps is a misfortune. Perhaps some scheme might be introduced to improve the distribution. The present Director has done so much that I cannot help hoping he will succeed in this matter also. With regard to the suggestion that the Society should spend £100 in making a model map; I quite agree with the reasons given to show that it would not be a very desirable use of the Society's money, and I doubt if the sum suggested would produce anything useful. As the Director of Surveys has said, I think we may leave it to the people who make the maps to go on experimenting, and that if we produce a typical map, we shall probably within the next five years want to alter it again.

Mr. Bolton: I should like to remind Major Close that a combination of contours and shade varying with the steepness of slope has already been tried. Some thirty years ago a map of Jerusalem was engraved for Murray's Ancient

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Atlas. The Ordnance contours were used as a foundation, and a very careful arrangement of hachures according to a strict scale was drawn upon them, and the map engraved. I think if he were to try a combination map of that sort he would find it very successful. But, as has already been said, such a map is too expensive for the private publisher to undertake. A standard map is, I think, impossible; £100 wou'd only produce a few inches. An ordinary 1-inch Ordnance sheet costs something like £500. And after all, is there anything better than an engraved ordnance sheet?

Dr. HERBERTSON: I should like to thank Major Close for introducing this subject. He seems to me to have looked at the map too much from the point of view of the military man, who wants as much detail as possible. I often want names and roads and boundaries, which interfere with the clear representation of the surface features, eliminated from the map. At the present time the 1-inch sheets are printed from at least two plates, one containing the names, the rivers, the roads, and other features, and the other plate the hill-shaded plate, with spaces left for the names on the first-mentioned plate. I think a very considerable service would be done if those two plates were slightly modified, and if on one plate we had the coast, the rivers, the contour-lines, and the hill shading, and on the other the names, roads, boundaries, and other details—that is, the permanent physical features would be represented on one plate, which could be printed and studied separately, while for those who wished to read the names and other details the map could be produced, as at present, from two plates. Perhaps an even better way would be to use an ordinary paper print for the feature lines, and to print the names and roads and other symbols on transparent paper, which could be fitted over the configuration map. Of course, other distributions could be printed on tracing-paper in the same way. It seems to me important that, in addition to having the contours close enough, they should be at regular intervals. At the present time the Ordnance maps cannot always be used for the comparison of slopes without calculation, because the contour intervals are not uniform. I think we might quite well adopt the American plan of having a closer contour interval of 20 feet in the plain, and of 50 feet or 100 feet in the hilly parts of the country. The use of close contouring in geographical investigations has been very well shown in the work of Prof. Kendall on the 'Glacial Lakes of Cleveland, in North Yorkshire.' In connection with the specimen maps, I am sorry not to see the $\frac{1}{200000}$ French map and the $\frac{1}{300000}$ of Southern Germany, which I think ought to have been in the list of first-class maps. I think that making the margin meridians is a very bad plan, because if you want to look at many sheets at a time, which I constantly have to do, it is very difficult to make the sheets fit. It would be much better to make the sheets rectangular, fitting at the bottom (in the northern hemisphere), or else in the middle, and repeating a roughly triangular part on the next sheet. I think if we are to have an ideal map made, the island chosen might be the Isle of Man, with its contrasting plain and highland, the Isle of Arran, or even the Isle of Wight.

Dr. DRYER: I do not think I can say anything with authority on the subject, not having paid special attention to it. I am most accustomed to the contoured maps of the United States Geological Survey, which seem to me to be very clear, and to fulfil all the functions of a topographic map. Since coming to this country I have become more familiar with maps of other kinds, and I see some advantages in them over the strictly contoured map, the principal one being their graphic character. The objection to the purely contoured-map is its want of graphic character and the inability of the ordinary person to read it. But I find, as a teacher of geography, that it is necessary for most persons to learn to read any

kind of a map; even the simplest map is not read spontaneously, and I do not think that it is more difficult to teach a person to read a contoured map than any other. I do not know that I can add anything of value to this discussion. I will only express my preference for the contoured map for showing relief.

Captain Russell-Brown: I only wish to make a few remarks on two points. The first is the question of reduction of maps by photography. I have a specimen of the new Ordnance Survey $\frac{1}{1000000}$ map of England, which has been reduced by photography to a quarter of its size. All the names on the reduction are legible with the help of a magnifying-glass with a strength of about three. It seems to me that such reductions would be useful as key maps for military purposes. The other point I want to raise is a question on which there seems to be much difference of opinion, perhaps more so than on anything else connected with the reproduction of an ideal topographical map, and that is the best method of representing hill features. If you look round the maps on the walls, you will find a Swedish map which clearly represents the hill features on the "layer system." This, in my opinion, is the best way of showing hill features on small-scale topographical maps. I think this method is suitable for maps on a scale of 4 inches to a mile and under. A point about this Swedish map, which seems capable of improvement, is that all the hill features might be printed together from one copper plate or copper transfer, instead of requiring something like half a dozen plates. On this system, the Ordnance Survey ¼ inch to 1 mile maps of England and Wales would require about seventeen different gradations of colour to show all hills at contour intervals of 200 feet. There is a specimen on the table of this so-called "layer system" of reproducing hill features, showing something like thirteen or fourteen different gradations of colour reproduced simultaneously from one copper engraving. I agree with Mr. Reeves that this "layer system" could be improved by graduating the colours between each successive contour, so as to avoid giving the impression of steps to the slopes.

Mr. George Philip: In the preceding discussion I think, with Dr. Herbertson, that too much stress has been laid upon military requirements in a topographical map. But the scope of an inquiry like this is to find out what is for all purposes the ideal topographical map, and as regards this I think a solution has not been arrived at. If we banish the question of expense of production, which so largely handicaps the private publisher, there is no doubt that the use of colours makes for the beauty and value of a map. And if, in addition to the colours advocated by Major Close, we combine tints, contours, and hachures, we can obtain a still more graphic effect. To my mind a perfect topographical map would be a kind of picture in which the elevations would be shown in detail by hill shading, the relative height by contour-lines (which when used by themselves are apt to ignore incidental surface features), and the absolute height above sea-level by a system of tinting in "layers." I do not think such a combination of flat tints, contour-lines, and hill shading has been sufficiently emphasized; it seems to me it would give the most perfect result. In conclusion, I cordially agree with what Mr. Freshfield and Mr. Ravenstein have said on the question of educating the public. The general public expects the price of maps to be so low, that the production, by private enterprise at least, of really good and valuable maps printed in a number of colours becomes almost impossible.

Major C. B. Simonds, R.G.A.: I think no opportunity should be lost in affording information by styles of printing and use of colours, of which in English maps full advantage is not taken. For instance, following logical reasoning (for simplicity), nothing in nature being bolt upright, upright printing should only be used for everything artificial—the work of man's hands—names of towns, villages, buildings,

railways, roads, etc.; while, the natural slope of printing being to the right, names of mountains, forests, rivers, plains, etc., should be in type sloping to the right; and peoples, tribes, tribal districts, parishes, etc., in type sloping "back-hand," to the left. As to colours, where employed, heights of hills and contours should be in brown; heights of rivers across them in blue (at normal water-level or mean tide); anything artificial, roads, railways, bridges, etc., figures in black. Complete absence of artificial effect is imperative; the beauty of the ideal map must be beauty unadorned.

Major Hills: I should like to make another remark or two. Dr. Herbertson was talking about the separation of the natural features on the map from the artificial features. That is one of the points of printing a map in colours. If, for instance, the hills are printed in brown, and the water in blue, and the detail and names in black, by printing only the blue and brown together you get a representation of the land and its surface features. A good deal of obloquy has been thrown on the British public in this discussion. They have been described as not using maps, and not being interested in them. I think that might have been very true ten years ago, but I doubt if it is the case now. I think if you went to, say, the Lake District, you would find just as many maps used as at Chamounix. I am sure, if the Ordnance Survey could arrange to put their maps on the railway bookstalls, they would have an enormous sale, especially for the half-inch maps. The question that has been raised as to representing slopes in different layers rather emphasizes what I said before about the necessity, if we are going to have a specimen map, of having two or more. Major Close proposed a system by which the steepness of the slopes was represented by the darkness of the shade. Now, here is a proposal by which the depth of shade depends on the height above sea-level; they are both consistent systems, and which has the advantage is a question of taste.

Mr. Reeves: I have listened with great interest to Major Close's paper and to the discussion that has followed, and think we ought to be obliged to him for re-directing our attention to this most important subject. I say re-directing, for it is a matter which, as most of us are aware, has been for a long time under the consideration of the Society, and I remember quite well, about fifteen years ago, a special committee being formed to deal with it. One of the many valuable results of Dr. Scott Keltie's 'Report on Geographical Education,' which appeared about that time, was to create a fresh interest in topographical methods, and since then the matter has not been lost sight of. It is, therefore, not a new subject to us. Personally I should very much like to see a specimen topographical map prepared, as it would be useful to me for instruction purposes. I could hand it round and show pupils what is required, and the sort of map that would be expected from them. The cost would naturally depend upon the method of production, but I doubt if £100 would be sufficient; however, I think it would be a good thing if it could be done. There are many points in Major Close's lecture I should have liked to have said something about, and several things I intended to say have been said already. The representation of the hill features is one of the most important matters. We are all well acquainted with the various methods shown on the different maps on the screens around the room. The layer system of tinting and contours is valuable for some purposes, but in many respects it is far from satisfactory. It always gives the impression of a country consisting of a series of steps or terraces, which, as a rule, is not in the least true to nature. Then, again, the tints are very often far from what they ought to be. It appears to me that if we are going to adopt this system at all we should use gradations of tints of one colour only, and not two or three different colours. For instance, I feel sure it is a mistake to jump suddenly

from green to brown. Such an abrupt transition is incongruous, to say the least, and without any change in the natural features to warrant such an abrupt change in colour. I have often known persons unacquainted with such maps to be misled by this sudden change in colour, and it certainly has a way of suggesting that where the green terminates is the limit of vegetation, in spite of any explanation of the tints which may be printed on the map. For ordinary purposes perhaps the combination of shading with contour-lines might be recommended; the contour-lines should show the difference of height with all the scientific accuracy required, and the shading ought to give the graphic effect. Doubtless for general purposes it is best to assume the light to fall vertically and the shading to increase in intensity with the slope, but I do not quite agree in condemning the oblique method altogether, for there are occasions, especially in mountainous regions, when this method gives a far better effect than any vertical lighting would do. Of course, the drawback to the oblique method is that it tends to give an erroneous impression of relative slopes, but this is greatly due to the fact that it is often overdone, as is the case with several of the maps before you. Whenever the system is adopted it should be combined with carefully drawn contours, which would prevent any one being misled. As to making use of the margins of the maps, I have often thought that there are times when they could be utilized with advantage, especially when space is a consideration. In addition to characteristic views, as suggested by Major Close, why not give vertical sections across the country in different directions upon them. There are many other points I might mention, but time will not permit. As to the method of folding so as to make the best use of space for tourist or military purposes, I had recently brought under my notice a suggestion, which seems very good. This consists in an ingenious system of mounting sections of the map upon the back so as to give the continuation in any direction by simply folding over. The idea can be seen from the map which I now place before you. It should be explained that the maps upon the screens are merely those referred to by Major Close in his paper, and no attempt has been made at a complete exhibition of specimens of topographical maps.

Captain CREAK: I have a small question to ask, but it is, however, an important one. Major Close says, "the magnetic declination should be mentioned for the date of publication, and its annual variation given." He has taken as an ideal island the island of St. Helena. Well, what declination could he give there, because its value varies in every part? All islands are similarly affected; in fact, wherever you go on land you will find local disturbances of magnetic declination from the normal value. I therefore suggest that the normal magnetic declination or variation should be given on maps, and instead of the words "annual variation," the annual decrease or increase. I think these are important for a map, and in regions where the magnetic declination is largely disturbed, a note to that effect should be given.

The CHAIRMAN: Before asking Major Close to reply to some of the criticisms that have been made, I should like to make one or two remarks. We have covered such a wide area this afternoon in our discussion, that it almost seems as if we had room enough for another afternoon's discussion on this subject. The discussion so far has only really referred to what may be called finished topographic maps. But there is a great deal to be said about maps which are not quite so complete as those you see on the walls around you. Major Close begins by stating that one requisite in a map should be that all the information it presents should be accurate. Nobody disagrees with that proposition, I am quite sure, but it is impossible sometimes to carry it out. The question is, when you have a map made up of material which is not homogeneous, some of which you know to be

inaccurate, but which at the same time represents country which is entirely new and has never been mapped before, what are you to do? Of this class are many maps of most important tracts of country extending beyond the frontiers of India. It is impossible to say of them that all the information contained is of equal value. It is most difficult to combine all sorts of material in the map so that there shall be no mistake as to what the actual value of any one part may be. I am inclined to agree with the remark made by Dr. Dryer, that some of the American maps as nearly approach to the typical topographical map as possible; but I have also a very great admiration for certain Swiss maps. As regards the representation of hill shading, there is just one method which I think no one has referred to, and which is the method which we have adopted in India after very many years of trial and experiment, which is found to answer best in the hands of our native topographers. That is the system of broken horizontal hachuring, combined with the continuous contour when possible. It is not always possible to secure the necessary time or money for running out accurate continuous contours. The continuous contour system is no doubt the most scientific method of representing ground yet devised, but I should doubt extremely whether it has been possible to carry out all the continuous contours shown in the American maps with strict accuracy; and if they are not accurate they are misleading. I have had lately to deal with maps in South America which were mapped on that system by continental topographers. The mapping was, of course, not of the highest order. It was carried out very rapidly under the sort of conditions in which we generally run out our geographical maps in India, and it was an attempt to represent the country by a system of continuous contours. The result was in many cases most misleading. In some instances it was impossible to tell whether a single contour represented a hill or a depression. I may add that the system of adding shading to the hachures in order to intensify the relief of the hills has also been tried very extensively in India, and found to fail in the field for the reason that no two men have the same idea as to the amount of shading which should be applied in order to give effect to a given slope. We do not find that difficulty as regards the pen and ink drawing of the horizontal hachuring. Men trained in the same school produce maps that are fairly concordant in their results. The representation of a slope of a certain steepness in one man's map will be about the same in all the field maps. That is not so when they are allowed to make use of the brush. Then their artistic fancy comes into play, and all sorts of errors creep in. But on the whole, in the reproduction maps, I may say that I agree that the addition of shading is most distinctly effective, if it is not absolutely instructive. Major Close calls attention to the deficiency in the number of heights shown on the face of the map as regards the plains. This undoubtedly is a very great and very common fault, but the reason of it is that the heights which are given are chiefly those of hill-tops fixed in the course of triangulation. It merely emphasizes the necessity for the free use of the clinometer in the topographer's hands. The topographer is generally responsible for heights of roads and rivers, but I admit that these are often deficient in number. Now, as regards the specimen map, for which it has been proposed to apply a given sum, I do not quite know whether it is clear to every one here that it was only intended to carry the proposal out strictly within the limits of the Royal Geographical Society's premises. There was no idea of offering £100 for competition; it was merely to be voted for the purpose of producing, so far as we could, what might be accepted generally as a typical topographical map. It has been suggested we recommend that proposition for the consideration of the Council of the Royal Geographical Society.

The CHAIRMAN put the resolution to the meeting, and declared it carried.

Major CLOSE: My difficulty in replying to the criticisms is that I agree with most of them. Most of the discussion turned on the representation of hill features, and I think it would be a very good thing if we could have a bit of country mapped which would give us before our eyes the same ground shown in four or five ways. It is very difficult to compare a bit of country somewhere in the Sahara with another bit of country in the United States, and another in Sussex. And it is very difficult to get any idea of the value of the different methods of representing hills unless we deal with the same tract of country. I was interested in Mr. Philip's suggestion of a combination of shading, tint, and contours. It would be a very good thing to try. The representation of the same ground on different systems has a distinct educational advantage. It brings up the different ideas of absolute height, relative height, and steepness in a way that no single form of representation can do. It seems clear that we should devote more attention to topography now that the Society's days of exploration are gradually drawing to a close. And if we are to delineate the surface features of the Earth effectively, we should make up our minds as to the best way to do it.

The CHAIRMAN: I have only now to ask you to join in thanking Major Close for coming here this afternoon to give us such an interesting paper. We have had a most valuable discussion. The only difficulty about it is that it has been almost impossible to compress the amount of information which might be gained from an assembly such as this into the space of time which was at our command.

GLAREANUS: HIS GEOGRAPHY AND MAPS.

By EDWARD HEAWOOD, M.A.

CONSIDERABLE attention has been called within recent years to various manuscript maps by Henricus Glareanus, the well-known sixteenth-century philosopher and man of letters, which exist in the libraries of the universities of Munich and Bonn, and which have been described respectively by Professors Oberhummer and Elter (cf. *Journal*, vol. 10, p. 328). These maps were of interest mainly from the fact that, as avowed by Glareanus himself, they were based on the long-lost world-map of Waldseemüller, the recent discovery of which has attracted so much attention, and were thus for a time the chief helps available for the task of reconstructing the latter. It has not been generally known that a still more interesting series of manuscript maps by the same hand is in existence, together with the original manuscript of the treatise on geography, first published by Glareanus in 1527, and subsequently reprinted a number of times during the course of the sixteenth century. It may be, therefore, worth while to briefly describe the maps and manuscript, now in the possession of Major-General E. Renouard James, R.E., pointing out some of the ways in which they shed light on the part played by their author in the geographical revival of the early sixteenth century. A few preliminary remarks are, however, necessary.

Heinrich Loriti, better known by his adopted name of Glareanus

(from Glarus in Switzerland), has been described as one of the most accomplished men of his century.* He was one of the foremost of the band of "humanists" who endeavoured to instil new life into the dry bones of the scholasticism of the middle ages: and in the wide range of his studies were included mathematics, astronomy, history, philosophy, classical literature, and other subjects. He also acquired some fame as a poet, and at an early age obtained the nomination as "poet laureate" to the Emperor Maximilian of Austria. His geographical contributions, with which we are here concerned, formed, in fact, but a minor part of his many services to knowledge and culture. The small treatise above alluded to, in spite of the favour with which it was received, did not display any remarkable knowledge of the geography of the world from the standpoint of the third decade of the sixteenth century, and it has sometimes been cast as a reproach against its author that he shows such slight acquaintance with the most recent discoveries in the New World, while this seeming ignorance has been adduced as an instance of the slowness with which the new knowledge permeated the community in those days. The chief claim of the book to notice was held to be the fact that it, for the first time so far as we know, described a convenient method of constructing gores for a globe, which was much used during the period in question, various examples of gores prepared after this method having come down to us. In spite, however, of the definite statement of Myritius in his 'Opusculum Geographicum rarum,' published at Ingolstadt in 1590, that Glareanus was the inventor of this method, doubts have been expressed on the subject, owing to the fact that, though the 'De Geographia' of Glareanus was only printed in 1527, similar gores are in existence which seem to date from a good deal earlier. It is one of the chief points of interest in the manuscript recently brought to light, that it helps, in part at least, to remove both the difficulties here alluded to.

The history of the manuscript, which seems to have remained in private hands since it was first written, is in itself of considerable interest. At the time of the Elizabethan Exhibition, organized by the R.G.S. in 1903, an old volume was sent in as an exhibit by Major-General James, which consisted mainly of a collection of private correspondence of the sixteenth and early seventeenth centuries, relating in great part to the Reformation period in Switzerland. The volume was one of three (two of which are now lost) which came to the present owner by bequest from his great-uncle, the Rev. George Renouard (for many years a Fellow of our Society), whose mother (born 1732) was a member of the important Swiss family of Ott, settled at

* For a sketch of the life and writings of Glareanus, see O. F. Fritzsche, 'Glarean, sein Leben und seine Schriften' (with portrait). Frauenfeld: 1890.

Zürich as far back as the fourteenth century. It was, apparently, another member of the same family who originally collected the documents, which have never since passed out of the hands of his descendants. The first two items in the collection were treatises of some length, written in a clear and elegant Italian hand, but both unsigned and undated. The first bore no title, but a statement on the flyleaf by a later hand (presumably the collector of the documents), ascribing it to Glareanus, at once showed its interest to the geographer, which was heightened when, on turning over the pages, the beautifully executed series of maps was disclosed to view. Confirmation of the authorship was soon forthcoming on a comparison of the handwriting with that of the marginal notes on the Bonn maps, as well as from the general agreement in style shown by the two sets. The statement by the former owner was based on a comparison with other known writings of Glareanus, so that all doubt was set at rest by the mutual support of the two independent pieces of evidence. The text of the manuscript was next compared with that of the printed treatise of 1527, and the result was to show that, while to all intents and purposes the same work, the manuscript differed in many minor points from the printed volume; while the fact that many corrections and marginal additions made in the manuscript had been embodied in the printed work, showed that the former was the original draft of the treatise, and not a later copy. But as the work as printed contained in places additions of considerable length, the manuscript was not the actual copy from which the printer had worked, but must have been of earlier date.

All this, together with the great similarity of the maps (which, it should be observed, were not included in the printed work) with those known at Bonn, which date from 1510, suggested that the manuscript was considerably earlier in date than 1527, and it was seen that, if this could be established, a satisfactory explanation would be obtained, firstly, of the existence of gores drawn after the Glareanus method as early as 1515 or thereabouts, and, secondly, of the failure of the treatise to represent at all accurately the state of knowledge at the date of its publication. That works were in those days often laid by for many years before being printed is otherwise exemplified in the literary career of Glareanus. The second manuscript treatise contained in the volume (which has to do with Roman coins and measures *) is identical as regards paper and style of writing with the 'De Geographia,' which, as we know, was certainly written before 1527. Yet it was only in 1558, or over thirty years later, that the second treatise was eventually given to the public. Internal evidence, while tending to confirm the idea of an early date for the work, does not seem to yield a positive

* Its title is 'De asse et partibus ejus.'

proof. It may be shown with certainty that the manuscript was written after 1510, in this way. Writing to the Swiss reformer Zwingli in that year, Glareanus refers to the Rome edition of Ptolemy (no doubt that of 1490) as containing no modern maps. Therefore in 1510 he had not yet seen the edition of 1508, containing the well-known map by Ruysch, in which all the modern discoveries were laid down, whereas a copy of this very map is, as we shall see later, given in the manuscript treatise. A posterior limit is not so easy to fix, but the following points are of interest. The description of England, both in the manuscript and the printed work, is but brief, but a notable addition in the latter is an allusion to the "eruditus rex," Henry VIII. A reputation for learning had been gained by the king even before his accession in 1509, and must have reached the ears of Glareanus at quite an early date through his intimacy and frequent correspondence with Erasmus,* who, as is well known, resided in England for long periods during the first two decades of the century, making the personal acquaintance of the king while still Prince of Wales. Yet no mention is made of him in the manuscript. A second point is this. In the printed work (chap. xv.) we find a paragraph describing the author's intercourse with the learned Paris professor, Budæus, which we know to have been maintained during 1520. But this passage does not occur in the manuscript, which we may therefore suppose to have been written before 1520, at any rate. All things considered, it seems probable that its date is not much after 1510, the date of the Bonn maps.

This is of some interest as tending to enhance somewhat the originality of Glareanus' treatise on geography. Thus it was almost certainly written before the appearance, in 1524, of the well-known 'Cosmographia' of Apianus, to which it bears some resemblance, and on which it might be thought to have been to some extent based, if first written about 1527. It may be noted here that in the small 'Cosmographiæ Introductio,' first printed in 1529 at Ingolstadt, where Apianus was professor, and thought by some to be his work, the concluding paragraphs are taken bodily from the treatise of Glareanus, which had therefore become known in Bavaria within two years of its publication. This gives additional interest to the fact that in the gores brought to light by Baron Nordenskiöld (cf. 'Facsimile Atlas,' Pl. xxxvii.), which are among the earliest instances of gores drawn after the Glareanus method, Ingolstadt is one of the two European towns marked, and was thus very probably the place where they were engraved. It may well be, therefore, that the draughtsman had become acquainted with Glareanus' method through the same channel

* A short letter from Erasmus to Glareanus, dated 1516, is included in the manuscript volume, but is in no way concerned with geography.

by which the printed work became known at Ingolstadt. In view of the predilection for map-drawing shown by Glareanus, it would be but natural to suppose that he had himself drawn a map of the world in the form of gores, on which some at least of the existing examples may have been based. On the other hand, if we accept the view that the gores in the Liechtenstein collection are those prepared by Waldseemüller in 1507 for the representation of the world "in solido," Glareanus cannot have greatly modified the method already in use, but merely supplied a convenient formula.* In any case, the method became generally known as having been originated by Glareanus, for it is so described, not only in the work of Myritius above alluded to, but also in the treatise added by Ruscelli to his version of Ptolemy, of which various editions appeared in Italy during the latter half of the sixteenth century.† There are one or two other points in regard to which the influence of Glareanus on his successors may possibly be traced, but to these we must return later.

The printed treatise of Glareanus, which was of small 4to form, consisted, with the title-page, of thirty-five leaves, and was divided into 40 chapters, starting from the elementary principles of geometry, the constitution of the universe and the methods of mathematical geography, and passing in the latter half to a brief description of the countries of the world. The arrangement of this part was almost entirely Ptolemaic, and only in the concluding chapter was reference made to America and other regions lately brought to light. It was illustrated by woodcut diagrams such as are found in most of the treatises on mathematical geography of the time. There were, however, no maps. The manuscript, which is of small folio size, contains, in addition to the diagrams (or most of them) which appeared in the printed work, the series of coloured maps to which allusion has been

* It may be noted that, on the Bonn polar map, Glareanus refers to the custom (followed by himself also), of placing the latitude notation in the interval between Zipangri and America. This would almost seem to show that he was acquainted with Waldseemüller's globe (or the gores prepared for it) as well as his plane-map; for the notation occurs in this position both in the Liechtenstein and the Boulenger gores, as also in the 1515 "Margarita" map, likewise ascribed to Waldseemüller. The reason would seem to be that the prototype of all, Waldseemüller's 1507 map, had started on the west from a similar line, along which the degree notation had therefore been marked. The fact that the longitude notation is marked along 50° S. might be thought to indicate that the maker or makers of the gores had previously had to do with maps ending at this latitude, as do those of Glareanus (the original 1507 map ceasing at 40° S.). A minor point of resemblance between the two sets of gores referred to and one of Glareanus' maps (the Munich hemisphere map) is the shifting of the southern extremity of South America from 320° to 330°, but this is probably accidental.

† In Rosaccio's reprint of Ruscelli's treatise (1598), Glareanus' name appears in this connection, by an obvious misprint, as "Galerano."

made above, together with an elaborate armillary sphere, and a diagram of the supposed concentric spheres of the universe. This last is of interest from the fact that in the centre of all is shown the town of Glarus, from which the author took the name by which he is generally known. The maps occupy seven pages, interspersed among the text, and are as follows. A map of the whole world, closely resembling the Bonn map, is, like the latter, a reduction from Waldseemüller's large map, while the hemispheres corresponding to the old and new worlds are shown in a pair of maps corresponding to the Alsatian geographer's insets. The next, occupying two opposite pages, is a reduction of the famous map by Ruysch, and though containing no original matter (for the legends, though given in the words of Glareanus, supply practically the same information as the Ruysch map), is of interest as showing that the Swiss savant was not content to take his information from one source only, but made himself acquainted with the best maps of the time. The last pair of maps are the most interesting, as forming (with the similar map at Bonn) the earliest examples of the employment of the equidistant polar projection that have come down to us. They are also the earliest instances of the division of the world into two circular hemispheres at all, the first printed map to do this being apparently that given in Ruscelli's Ptolemy in 1561. Whereas in the Bonn map the southern hemisphere was shown on a much smaller scale than the northern, and with the outlines reversed, in the present version the two exactly correspond. The adoption of this more or less obvious method of representing the globe does not necessarily imply an acquaintance with abstruse mathematical principles, but it at least shows its author as one who took an intelligent interest in the improvement of cartographic methods.

In regard to the projection of the other maps, there are one or two points to be noticed. While broadly conforming to that used by Waldseemüller for his great map of 1507, which was the second, or so-called "homeoter" projection of Ptolemy, Glareanus has introduced slight modifications of his own, which bear out the idea that it was in the technique of geographical science that he was particularly interested.* Thus the circles which represent the parallels of latitude are not concentric, as in other examples, but the centre is removed further and further from the equator as the north pole is approached. The intention would seem to be to avoid the great variation in the degree spaces intercepted on the meridians at different parts of the map, for we find that on the maps in question the lengths of the degrees of latitude are practically equal throughout, in spite of the obliquity

* The degree net has been somewhat more carefully drawn in the maps in General James's manuscript than in the maps previously known at Bonn and Munich, and may, perhaps, represent the final result of various experiments.

of the angle at which the meridians and parallels intersect at the edges of the maps. To bring about the said result, it has been necessary also to depart from the true proportion between the lengths of the degrees of longitudes in different latitudes, so that diminished distortion has been gained at the expense of equality of area. It would also be impossible to continue the map to the pole without concentrating the whole amount of distortion into the small area immediately surrounding the latter. North of 70° the degree net has, in fact, been constructed in a purely arbitrary fashion, with a view, apparently, of giving it a harmonious finish, by continuing the meridians in an even curve to the pole. Something similar has been done by Munster in one of the maps in his edition of Ptolemy, but the apparently close resemblance between this and Glareanus' maps is not borne out on further inspection, for the circles of latitude are concentric in Munster's map, and the diminution in the lengths of degrees of longitude is carried out in a different ratio. Still, from the intimate association of both geographers with the city of Basel, it is not impossible that the work of the one may have had some influence on the other.

It should be noted that, in the printed work, still another method of constructing the degree net is illustrated by a diagram, the parallels being in this case represented by straight lines, as in so many of the printed sixteenth-century maps, from Bordone (1528) to Ortelius; but whereas in these the parallels are drawn at equal intervals, in Glareanus' scheme they become rapidly closer as they approach the pole, their position being determined by a division into equal parts, not of the mean meridian, but of the circumference of the circle bounding a hemisphere. The method is again described by Moletus in his 'Discourse,' incorporated in Ruscelli's Ptolemy, and was used for one of the maps of the world to be found in Rosaccio's re-issue of the latter (1598), though in all other respects this was avowedly merely a copy of Rumold Mercator's map, while in Magini's Ptolemy of 1597 the latter's projection has been retained.

One other point is perhaps deserving of comment. This is the distinctive colouring of the continents, which is the same in all the maps now described, though the arrangement of the colours is somewhat different from that adopted in the Bonn maps. From a passage in Ruscelli's treatise above referred to, it appears that a convention was generally followed in his time with regard to the colours used for the different continents, which he assigns, curiously enough, almost exactly as they are employed by Glareanus, the only important difference being that, while Glareanus used green for America as well as Europe, in Ruscelli's time a lighter tint of the yellow with which Africa was coloured was chosen for America, red being used in each case for Asia. Ruscelli refers to the fashion set by those who began

to colour maps in this way ("perche cosi han cominciato a farle i dipintori"), and it would seem that here, too, the influence of Glareanus may be traceable, for, though his maps were never printed, his methods were no doubt widely known through his pupils.*

NOTE.—A reproduction, in colours, of Glareanus' North Polar map has been prepared at Chatham under the supervision of Major C. F. Close, R.E., and will appear, with accompanying letterpress, in the June number of the *R. E. Journal*.

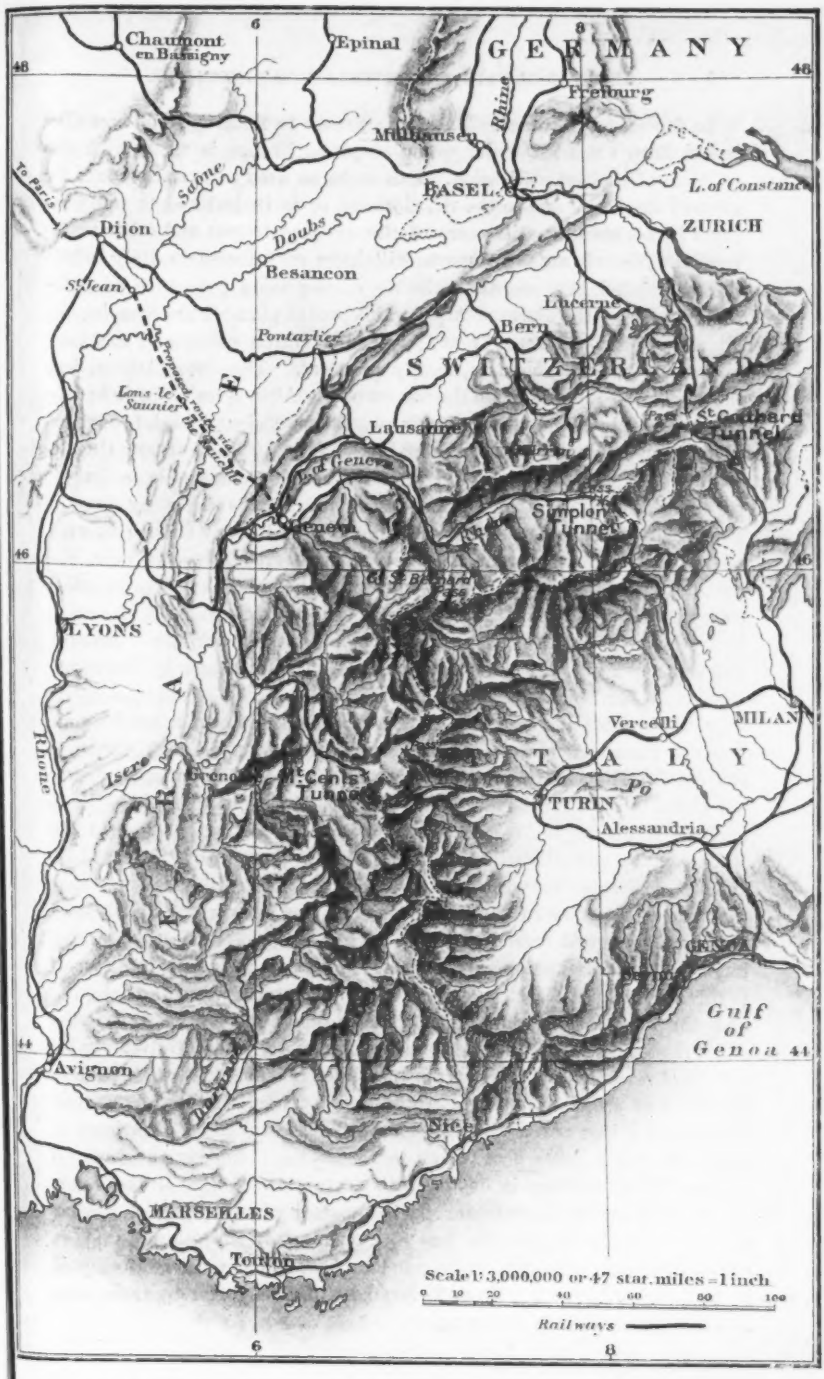
ALPINE RAILWAYS AND INTERNATIONAL COMMERCE.

By A. J. SARGENT.

IN spite of the recent development of the American continent, the Mediterranean and the East, thanks to the Suez canal, still seem to dominate, as in the Middle Ages, the economic ideas of Europe. Political schemes, and the unknown economic possibilities of the Far East, may, perhaps, be responsible for a somewhat exaggerated estimate of the value to Europe of Eastern commerce; but this estimate, whether destined to be justified or not, has a profound influence on present policy. The political rivalries of the Powers, here as elsewhere, are reflected in the economic arena. So the attack on the Alpine barrier, in one aspect at any rate, may be criticized as a phase in the struggle for the control of the East. The St. Gothard tunnel pierced directly, instead of outflanking, the ancient barrier between the plain of north-western Europe and the Mediterranean. The substitution of the artificial route for the natural outlet by way of the Rhône and Marseilles was undoubtedly a blow to those interests which France had built up in the course of centuries on the basis of her physical position. The chief line of communication, north and south, was removed suddenly beyond her frontiers, inflicting a twofold loss, as it affected international traffic or local relations with the Italian markets. The gain was to Germany and the Italian seaports. The St. Gothard scheme may be regarded as the economic complement of the movement which resulted in the Triple Alliance. It placed Germany in a commanding position in the chief Italian markets, and at the same time, by providing a short cut for fast traffic to the East, it added to the German sphere a new port in Genoa. France was side-tracked from the main line of continental traffic to the Mediterranean, though she still retains the bulk of the fast traffic from London, the chief terminus of the Far Eastern route.

Hence it is no matter for surprise that, a generation ago, proposals were made in the French Chamber for a new tunnel through the Simplon,

* In some of the early printed editions of Ptolemy in which the maps have been coloured, we find red used for Europe, and yellow for Africa, while Asia is left white.



MAP TO ILLUSTRATE RAILWAY COMMUNICATIONS THROUGH THE ALPS.

to be financed by France. The project came to nothing; but now that it has been executed under other auspices, France is faced with the problem of its best utilization. Can it be so used as to compensate for some of the losses due to the St. Gothard, or is it destined to reinforce them by abstracting still more of the existing transit and other traffic from the French area? Geneva will have easy access to Italy, while Berne, isolated between the existing routes, has a project in hand for the piercing of the Bernese Alps, which would give *viâ* the Simplon an alternative through route from Italy to the Rhine valley and the Low Countries. The problem is mainly physical. The Jura plateau, less impressive on the map than the masses of the Alps, is an obstacle hardly less formidable to the railway engineer. It is sufficiently high to involve severe gradients and risk of snow-blocks for any line surmounting it, while its great breadth would require tunnels comparable in length to those under the Alps. The present route from Dijon by way of Pontarlier to Lausanne is unfitted for fast and heavy traffic; it must be improved greatly or an alternative discovered. In any case, the scheme would be costly, and various projects have their enthusiastic supporters in France. It is a matter for the engineer and the geologist. But, whatever be the ultimate plan adopted, the work must be done, and done quickly, if France is to obtain any advantage by the transference of her objective from Turin to Milan. The advantage would be considerable; it may be estimated, perhaps, at two hours in time between Paris and Milan. France would thus secure better access to the chief Italian markets, and at the same time establish more firmly her claim to the Indian mail route from London. But the gain of Paris and the Loire region would probably represent a further loss to the Rhône valley and Marseilles, and it is hard to see how this could be avoided. Prosperity which depends largely on position is somewhat unstable under modern conditions of transport, as various districts in England have good reason to know. This is a characteristic result of improved communications all the world over. The Italian route itself is threatened by the eastern extension of the German system. Salonika and the Piræus may one day become formidable rivals to Brindisi and Trieste, while they in turn, perhaps, may be affected adversely by the Euphrates valley line. It is possible, however, to over-estimate the value of such schemes for international traffic. There is no need yet for the shipowner to tremble greatly for his business. For general traffic the rail is but a poor substitute for the sea. Neither the Siberian nor any other railway is destined to destroy the value of the Suez. The experience of Manchester in the matter of railway rates, an experience largely responsible for the opening of the Ship Canal, is sufficient proof. Freights at 7*s.* per ton from Manchester to Liverpool by rail, and 14*s.* per ton from Liverpool to Bombay, convey their own lesson without need of comment.

By a curious irony of events, at the other end of the chain of far-eastern communications, France has been promoting a scheme which might provide for others the experience which she herself has suffered. The development of railways in the Red river basin is in part directed to the side-tracking of Canton and even Shanghai from the route to the unknown wealth of the Yunnan region. The Burma railway scheme is a similar project of still more drastic character. The relative cost of the rival lines is a mere question of engineering; but the extent to which they could compete with transport by road, river, and sea is far from easy to estimate. The advantage of the rail lies in the shortening of time and the possibility of avoiding transhipment; but there it ends. Even if the whole trade of the terminal region could be thus diverted, it is doubtful whether it could support a great trunk line. The move is a move in the dark. The prophets have experienced so many disappointments in the Chinese area, that there is good ground for caution, if not for pessimism, in dealing with any large project.

The railway projector is much to the fore at present, with plans for connecting and developing the newer regions of the world. The investor might be grateful sometimes for more definite estimates of the expected commercial profits. These are sometimes left to the imagination, and imagination is hardly a safe guide in such matters. Each continent has its own special schemes for great trunk routes, though in no two cases are the conditions the same. The bridge over the Zambezi is acclaimed as another link forged in the great African chain from the Cape to Cairo. A scheme so vast inevitably appeals to the imagination: but can it justify itself economically? Suppose the difficulties, financial and political, overcome, and the great trunk road completed; it is natural to ask, What definite object will it serve? The experience of South Africa may provide some illumination. If this region is to have any permanent value for the white races, it seems likely that the economic centre of gravity will be far removed from the Cape. The natural means of access to this centre will not be by a long and costly route from the extreme south, but by a short cut from the nearest port on the east or west coast. The transference of traffic has already been effected on a considerable scale, and is destined to continue. A freight-rate from Port Elizabeth to Johannesburg of £7 per ton as against 30*s.* for the same goods from Europe to South Africa, is sufficient proof of the need of shorter railway routes. At the other end of the chain, Lower Egypt is to be avoided by a direct line from the Nile to the Red sea. In fact, the two ends of the Cape to Cairo line are fast losing their character as integral parts of a through route. The African areas naturally seek the shortest way to the sea and to Europe; the Uganda line is a case in point. The great trunk lines of the world inevitably suffer from their permanence, as opposed to the flexibility of ocean trade routes. When, as in Canada, there is

a growing community at either end and an absence of alternative means of transport, when, too, there are evident possibilities of development in the intermediate regions, there may be a reasonable prospect of economic success. But few existing lines are in this happy position. If it still pays to send goods round the Horn from New York to San Francisco, what will be the position of the railways of the United States when easy communication by sea is established, *viâ* the Isthmus, between the industrial eastern States and the west coast of the Americas and the Far East? They may lose as the Suez will lose; the advantage will be to American industries. Indirectly, too, the West Indian islands, hitherto outside the main tracks of the world's commerce, may hope to gain somewhat in economic as well as political importance from their position on what will be the second great sea-route of the world. The problem is the same everywhere. On some of the American railways the utmost possible economy, and therefore the lowest possible cost in the carriage of goods under present conditions, has been reached; the great ocean lines, on the other hand, have established normal rates to various regions, which are probably somewhat above the level at which they could afford to work and still make a profit. Here is a basis for comparisons at the present moment. But the steamers are not tied to a costly permanent way, and can take immediate advantage of any shortening of routes; nor have they yet reached the limits of speed and carrying capacity: yet speed for passengers and mails, and the absence of transhipment for goods, are the chief weapons of the rail in its fight with the sea. The railway projector and the investor, in promoting schemes for a distant future, do not always make due allowance for the element of flexibility.

THE ALEXANDER-GOSLING EXPEDITION.*

We have received a further budget of news from Lieut. Boyd Alexander, bringing down the record of progress to February 2 last, at which date the leader was at Maifone, whither he had returned to visit his brother's grave before finally starting from Lake Chad in the direction of the upper Nile. As already mentioned, it was his intention, if possible, to cross the lake by boat, sending the main caravan round by road, under Captain Gosling, to Kussuri, which was to be the next base of the expedition. The greater part of the letter is devoted to a description of the route followed last year between Loko on the lower Benue and Yo on the west side of Chad, and as this traversed, in part, districts not yet visited by white men, Lieut. Alexander has been able to collect some interesting information, both on the country and the people, especially the distribution of the native tribes, the number of which is, he says, truly remarkable.

The scenery, which was at first uninteresting, showed signs of improvement on leaving Nassarawa, the flat bush-covered country, with its tropical river-belts,

* See *Journal*, vol. **24**, p. 589; vol. **25**, pp. 176, 456.

being studded in places with groups of conical rocky hills clothed with tree-growth, while the hill country north of Keffi showed out in the blue distance. Nassarawa did not particularly impress the traveller, the wealth of the Fulani having much diminished with the recent reduction of slave-trading activity. The street corners are now remarkable for their beggars. Keffi, another large town of round and square mud-built houses, surrounded by a massive wall over 2 miles in circumference, is in great part in ruins, the result of the reprisals taken by the British authorities after the murder of Captain Moloney. It is now a British station with a Resident and Police Officer.

Lieut. Alexander does not appear to have been favourably impressed with the Fulani, the spread of whose influence throughout Nigeria is not, he says, so remarkable as it might seem, only the tractable plain-dwellers having been subjected to it, while the Pagan hill tribes have been left severely alone. Intermarriage has caused an almost total disappearance of the original Fulani stock, though an indication of what this must have been like is afforded by the "Bush Fulani," a small and dwindling community, who live entirely in the bush, driving their flocks from one district to another. Retiring and shy in disposition, they seldom approach the towns, but carry on necessary traffic in bush markets held on certain days. The women are handsome, tall, and pale-skinned, with oval faces surrounded by thick twists of silky hair. It is the general opinion and hope amongst the Fulani that the rule of the white man will not be for long, and this idea is fostered by the Senussi, who are very active just now, especially about Kuka.

Beyond Keffi the main road was left, a north-easterly direction being taken for the Fulani town of Dorroro, situated at the foot of a lofty hill range, the stronghold of the fierce Kagoro tribe. These people are head-hunters of the worst type, and, as among the Dayaks, a man must produce so many heads before he can aspire to a wife. Lieut. Alexander made his way to a village of the Kagoro, named Petti, built on the sides of a high rocky hill, the small mud houses being cemented to projecting rocks, and to be reached only by the narrowest and steepest of paths. The people, who were seen from a distance squatting like monkeys on the rocks, are strongly built, but their feature are disagreeable, and show a marked resemblance to those of the tribes south of the Benue. They are keen hunters, fight with poisoned arrows, and use small hill ponies, by means of which they quickly communicate from one hill-top to another. The hills inhabited by them extend to within a few miles of Badiko. Not far from the latter are the tin-mines of Tildi, but, owing to the dangerous nature of the country, little has yet been done to exploit them properly. West of the Kagoro country are the Kachia and Panda hills, about 800 feet high, forming the watershed between the Gurara and Kaduna rivers. They are inhabited by the Kachias, if anything still lower in type than the Kagoro. Among the men a leaf forms the only covering, but the women wear behind a curious cylinder-shaped ornament, 8 inches long and 3 in diameter, which at a distance gives one the impression of a tail that has been docked. They also insert discs of wood in both lips, which cause a revolting disfigurement.

The journey was made in the height of the rains, and, being through a well-watered region, the fording of streams was continuous, while in several places bridges had to be made. The Gurara was in full flood, and was running at the rate of 15 miles an hour, so that its crossing (by native rafts) took nearly a whole day. On September 8 Bauchi was reached. The emir, whose palace consists of a series of lofty flat-topped structures of mud, with walls 6 feet thick, still keeps up a show of state, and strangers are received with many formalities. The rooms of the palace have groined roofs of clay, which, being blackened by age, have all the appearance of old oak. The emir sees as little as possible of Europeans, and

Lieut. Alexander was not much impressed by his friendliness. At Bauchi the little-known route to the Gongola through Goram, Kufa, and Ako was taken, instead of the main road through Gombe, and the leader was able to prove the accuracy of the mapping previously done by members of the expedition. The towns hereabouts are Fulani, with a mixture of Hausas. The walls are in many places ruinous, as their repair would be understood as implying the wish of the chiefs to fight again, and cannot therefore be allowed. At Maimadi an exhibition of Hausa wrestling was for the first time witnessed, and the performance is described as a most striking one. Wrestling is adopted as a means of settling disputes, and is carried on in a most orderly way in the presence of umpires, all the inhabitants turning out as spectators, while the performers observe the rules of the game in every detail. The wrestling resembles that of the Greeks and Romans, and as the Hausas alone practise it, Lieut. Alexander suggests that they may have brought it with them from an earlier home in North Africa, and that light may be thrown in this way on their past history. A route from Egypt along the shores of the Mediterranean to Tripoli, and thence across the desert, would be the most likely to have been followed, as being the best calculated to develop the trade to which the Hausas are so devoted. The use by these people of the term *Rakumi daji* ("camel of the bush") for the giraffe is also pointed out as an indication that they came from a land where they had been familiar with the camel before learning to know the giraffe.

On October 8 the caravan crossed the Gongola at Ashaka, and in three days reached Gujiba, traversing a country well wooded in places with acacia. Gaidam, on the Komadugu, was next reached. With its sandy stretches and square mud-built houses, it had the appearance of an Egyptian town. The road hence to Yo gave occasional glimpses of the Komadugu—a pretty river with a very winding course, its southern bank thickly wooded with acacia, which here and there gave place to bright green patches of young wheat (*alkama* in Hausa), which is grown in some quantities by the help of irrigation. The adoption of a hard-and-fast line like the Komadugu as the Anglo-French boundary is thought by Lieut. Alexander to have its drawbacks, as deserters, when once across it, cannot be touched by their former chiefs. This would, however, be incidental to any new boundary in a region only partially under control. The towns on the south bank along the lower course of the river are inhabited by the Mobbur, described as closely resembling the Berbers. The women are small, with round faces and somewhat *retroussé* noses, which are ornamented with coral in the Kanuri fashion. The hair falls at the sides and back in a straight fringe of thick twists. The dreaded Tubu come very close in appearance to the Mobbur. They give much trouble, raiding and robbing the caravans on the south side of the river and retreating to the other side with the spoil. By the end of December the river has fallen so much as to be fordable in many places, and at this time the Tubu reap a golden harvest. They travel in small bands, covering long distances on their camels and small fast ponies, concentrating when a raid is in contemplation. Not long before, the great Mecca caravan had been attacked by a combined force of Tubu and Mobbur (the latter of whom use poisoned arrows) on the way from Gaidam to Yo. Thanks to the bravery of the Kachella of the latter place, the freebooters were kept at bay until the caravan reached Bulturi, but it was closely besieged there until Lieut. Alexander came to the rescue with a force of archers. The caravan, which had originally left Timbuktu more than two years before, had at the time swelled to the number of 700, who formed a picturesque and motley crew, each band of pilgrims driving its own particular herd of cattle (the total reaching nearly 1000), and carrying all its worldly belongings. The sight was most impressive, and

seemed more properly to belong to a bygone age. Besides Fulani, there were in the caravan (which included whole families down to the smallest infant) many pilgrims from Melli, north of Sokoto. The Melli women are tall and handsome, dark-skinned, but with Arab features. They wear massive silver earrings, and their hair is done in the Fulani fashion—dressed in the shape of an inverted canoe along the top of the head. These caravans pass through Bornu every four years, and the "Mallums" in charge expected to reach Mecca in four years from the date of reaching that country.

In Bornu, besides the Kanuri and the Arabic-speaking Shuas, the Kanembu (from Kanem) are met with about Kuka and to the south-east. The men are remarkable for their height, but dress like the Kanuri in the dark-blue "tobe" reaching to the knees. The women disfigure themselves by inserting a stick of coral in the left nostril. They pay much attention to their coiffure, the hair on the crown being beautifully plaited, and the ends brought down in a thick fringe all round. In Central Bornu, the grain-fields, which require but little cultivation, extend in places as far as the eye can reach. Like former travellers, Lieut. Alexander speaks of the laziness and vulgar swagger of the Kanuri, who, however, worked better under Rabeh and his son Faterella than they do now. The son, as well as the father, is said to have been a capable ruler. A large part of northern Bornu is practically useless, scarcity of water being the burden everywhere. At the time of writing, the harmattan was blowing, and the weather, especially near the lake, was very cold, the thermometer falling to 43° in the early mornings. When the wind is strong, the whole country is enveloped in a chilly sand-laden atmosphere, the resemblance to a foggy day in England after a hoar-frost being enhanced by the coating of sand which covers the branches of the acacia trees. As already mentioned, the objective of the expedition is now Mahagi, on Lake Albert, whither the leader hopes to take the boats, making use of the river systems *en route*.

REVIEWS.

AFRICA.

Tunis.

'La Tunisie au début du XX^me^ Siècle.' By various authors. *Illustrated.* viii., 368. 8°. Paris: de Rudeval. 1904.

This is the second volume to appear in a series which was inaugurated with a similar work on Madagascar, and is designed to promote interest in French colonial expansion. The chapters are lectures originally delivered in Paris in 1902, under the auspices of the Société de l'Enseignement Colonial Libre. Prof. Blanchard, of the Faculty of Medicine in Paris, has acted as editor, and Prof. Marcel Dubois contributes a geographical introduction. There are eleven other collaborators, all specialists in some science, and the result of their joint labours is an authoritative, although necessarily very rapid and popular exposition of the present state of knowledge in regard to the geology, botany, zoology, archæology, anthropology, and actual social state of Tunisia. About a third of the volume is taken up with antiquities and politics. The latter section and that on native society are naturally a good deal coloured by colonial propagandism. All is for the best in that best of all possible worlds, a French colony; magnificent vistas of progress open to infinity; the people and their protectors are welded together by a union of hearts; and so forth. But on the whole the account is characterized by sanity, and we note one reasonable

and luminous suggestion in regard to western Islam—that the tendency of North African Moslems to form themselves into confraternities is not due to any instinct for conspiracy, as many alarmists have taught, but to native inability to find complete satisfaction in the pure Arab cult, which admits no intermediary between man and God. The confraternities practically introduce the priestly element, so sternly excluded by the Prophet. Prof. Dubois' lecture is mainly concerned with climate, and he discusses the difficult question of climatic change in historical times. The geological chapter suffers by the indifferent reproduction of its illustrations; it deals with what may be called applied geology, *i.e.* the utilitarian aspect of the science, mineral deposits, water-bearing strata, and so forth. It is to be regretted that its author, M. Pervinquière, has not touched on the interesting problem of the coastal sinking in North Africa. The botanical chapters are two, the first dealing with native vegetation, the second with cultures and acclimatization. Bibliographies for fuller reference are appended to the different chapters, but they are evidently meant for French rather than international readers.

South Africa.

'History of South Africa.' By George McCall Theal. *Numerous charts.* 3 vols. Swan Sonnenschein. 1903–4.

For over forty years Dr. Theal, late keeper of the archives of Cape Colony, now colonial historiographer, has been engaged in preparing and publishing various works on the geography and history of Africa south of the Zambezi. Of these the most comprehensive have been a 'Compendium of the History and Geography of South Africa,' three editions of which appeared between the years 1874 and 1877, and a 'History of South Africa,' covering the period from 1486 to 1872, issued in four *unnumbered* volumes in 1888–91. The three volumes here under notice are also unnumbered, and as, moreover, they begin and end most abruptly, with no clear indication, either on the title-pages or in the preface, as to their relation to other publications, it should be explained that they form a section only of a series which is doubtless intended to be final, and to supersede all previous works dealing with South African matters. Above chapter i. of each volume occurs the heading "History of South Africa since the British Conquest," while on the several title-pages are given the periods 1795 to 1828, 1828 to 1846, 1846 to 1860, which are covered by the respective volumes, and are treated with great detail in the light of numerous fresh data drawn from official and other generally trustworthy sources.

Here, therefore, we have presumably Dr. Theal's last word on the many obscure or entangled questions which kept home and colonial feeling at boiling heat for over six decades, and some of which still await satisfactory solution. It will, I think, be conceded that, with perhaps one notable exception, the author's claim "to write without fear, favour, or prejudice, to do equal justice to all with whom I had to deal," is fully sustained. A due regard for rival interests, an unbiassed and judicious, one might almost say judicial, tone, pervades these authoritative volumes, which are, moreover, written in a lucid if somewhat pedestrian style. Assent will readily be accorded to Dr. Theal's conclusions on the emancipation and its consequences; on the rights and wrongs of the burghers before and after the Great Trek; on the Natal, Orange River, and Transvaal settlements; and especially on those deplorable Kafir wars which followed each other, so to say, automatically over a great part of the nineteenth century, all inevitably provided for by the pernicious Glenelg policy, itself the expression of the sham philanthropy at the time rampant in England, and still far from extinct. This whole section will serve as an excellent object lesson on the fatuous teachings of the Reads, the Philips, and some other

missionaries, who went about proclaiming the absolute equality of all races, and telling the blacks that they "were in all respects, except education, mentally equal to the European colonists."

The above-mentioned possible exception to Dr. Theal's uniform impartiality has reference to his treatment of the Kolobeng episode, in which he tells us that he followed Livingstone's account in all the editions of his history issued before 1878, but in the light of fresh evidence has since adopted what must be distinctly called the Boer version. But to the ordinary reader he will appear to have done much more than this, since a comparison of the early and later editions plainly shows that his whole attitude towards the Transvaal Voortrekkers has, without any apparent reason, undergone a complete change. Whether Livingstone's books and papers were scattered over the veld by the Boer commando, or by a band of hitherto unidentified "lawless deserters," is of course an important, though after all a secondary matter. The real points were the general treatment of the natives by the Boers, the kidnapping of their children to be brought up as "apprentices," that is slaves, and the persistent efforts of the burghers to block the "English road" to the interior of the continent. Of all this we now hear little or nothing. The English road now becomes merely the "lower road;" the Maccabe incident is suppressed, and it is merely stated that the children captured at Kolobeng "were apprenticed to various persons." But we are no longer told, as in the early editions (ii., p. 162), about the sad fate of these "wretched orphans" [both parents being killed], and that "hardly any condition could be more pitiable than that of these unfortunates." It must be added that most of the fresh evidence appealed to in explanation of this apparent *volte face* comes from tainted Boer sources, such as that of a Commandant Scholtz, who is himself deeply implicated, both for causing Livingstone's workshop to be broken open in his absence and confiscating "the whole of the loose property in the place," and also for retaining as "apprentices" the children of the Bakwena people captured on this occasion.

All of these boldly printed volumes are supplied with carefully prepared synoptical indexes, and with sketch-maps or "charts," which will be found useful in following the text and studying the gradual expansion of the white settlements south of the Zambezi.

A. H. Keane.

The Hydrography of the Nile.

'The Nile in 1904.' By Sir W. Willcocks, K.C.M.G. London: 1904.

Though books dealing with the basin of the Nile are numerous, those which treat specially of the hydrography of the river are few, and the present volume is intended by the author to bring up to date Lombardini's essay on the hydrography of the Nile, which was published forty years ago;* but the fifty-five pages which have been allotted to hydrography are insufficient to represent adequately the hundred and ten pages of Lombardini's essay, as well as the information which has accumulated since then.

The course of the Nile is briefly described, and the slopes and velocities of the different reaches are detailed, but the altitudes used are not always those which are usually taken as the most probable values. Lado is taken as 447 metres instead of 465, but no reason is given for preferring the lower value.

The rainfall of the basin is very superficially dealt with, considering its importance and the large increase of data in the last ten years. Several errors are due to this, and the basin of the Blue Nile in Abyssinia is credited with a good

* 'Essai sur l'Hydrologie du Nil.' Milan, 1865.

rainfall throughout nine months of the year, which is probably based on that of Adis Abeba on the eastern escarpment; but all over the tableland there is a sharply defined period of four months, only extending to five in the more southern parts.

The geology of the lake plateau is of great importance in determining the drainage, since Dantz and others have shown that the movements of large blocks of the country have given rise to valleys with a low slope, in which the rivers lose themselves in the marshes which fill the valley floors. Indeed, without a knowledge of the structure of the country the drainage cannot be properly understood. Still, the account given is meagre, and does not include recent results, Ruwenzori being still described as a range of lofty volcanoes, in spite of its vulcanicity having been repeatedly disproved.

Passing to the more detailed description of the different lakes and rivers which supply the Nile, the statement that the rate of evaporation on the Albert lake is greater than on Lake Victoria is surprising, since the former lies 450 metres lower, and is much more sheltered from winds, so that a lower rate would be expected. There are, however, no observations available. The regulating action of this lake is said to be such that the floods of the Victoria Nile are delayed five months in their passage down the Bahr el Jebel; but this seems to be an assumption based on the maximum level of the lake being reached in December, while the Victoria lake is usually highest in June. The effect of the rainfall of this region has, however, been misunderstood. The discharge of the Victoria Nile after passing through Lake Choga becomes practically a constant amount, and it is the rainfall on the hills north of Foweira which causes the flood in the lower reaches near the Murchison falls. This rainfall begins about June and ends in October, while at the south end of the Albert lake it is heaviest in May and November, so that the combined effect is to produce a rise in the Albert lake, and at Wadelai from May to December. In discussing the Bahr el Jebel, or the Albert Nile, as Sir W. Willcocks would prefer to call it, he states that the said * region is flooded by the Sobat flood to a depth of 3 metres, which would, indeed, give a vast quantity of water temporarily stored. But if the water-slope between Lake No and the Sobat is considered, it will be found that a rise of about 2 metres in the Sobat will produce the flood slope in the White Nile above it; and in 1903 the Sobat rose in all 3·5 metres, causing thus a rise in the water-level at Lake No of about 1·5 metre, or about 1 metre above its banks, which agrees well with observations made by a survey party in September. If now the slope of the Bahr el Jebel be considered, it will be seen that the flooding due to the Sobat must soon disappear upstream, though its effect will be more pronounced in the Bahr el Ghazal, where the slope is less, and it is probably the main factor in producing there the late maximum in December which Dyé noticed. Sir W. Garstin's sections of the Bahr el Jebel, some of which are reproduced in this book, do not show any such inundation effect. Sir W. Willcocks follows Lombardini in assuming that the swamps of the Bahr el Jebel and Bahr el Ghazal occupy the site of an ancient lake, an hypothesis which presents many difficulties, and would hardly have been put forward by this distinguished engineer had he ever visited the region south of Khartum. In the present work this lake is described as occupying an area of 160,000 square kilometres, or two and a half times the size of Lake Victoria, and as being fed by the waters of the Sobat, the Bahr el Jebel, and the Bahr el Ghazal, while the Blue Nile

* It is very desirable that the word "sadd" should be limited to its proper meaning —a block of vegetation in a water-channel. It has of late been also used to designate a district and a class of vegetation.

also is made to "flow backwards up the bed of the present White Nile" into this lake. No evidence is put forward for such a reversal of the drainage of the country, and there is much which contradicts it. Unless subsequent earth-movements are assumed, the lake must have risen to the same level north of Lake No as south of it, which would considerably increase the size. No signs of shore-lines, terraces, or the deltas of tributary streams are to be seen where the margin of this lake would have been. On the drainage being reversed, the present White Nile should have cut through thick deposits which had been laid down by the Blue Nile when it entered the lake, but no such alluvial beds exist.

The country near Khartum shows no sign of the movements which must have taken place to turn the Blue Nile from flowing southwards, as assumed, into its present course. On the other hand, a stream flowing with a low slope in a shallow valley which is more or less flooded in the rainy season, furnishes all the necessary conditions for the formation of these marshes without creating a former lake to explain them.

At Khartum the holding up of the lesser stream by the greater again occurs, but with much greater effect than at Lake No, on account of the volume of the Blue Nile in flood. The author, however, exaggerates this very greatly when he says that the water of the Blue Nile flows 300 kilometres up the White Nile in summer. As the level of the Blue Nile increases, the level of the White Nile is raised by water coming down from above, and not by the Blue Nile flowing up it. There are many proofs of this, both from observations made at Dueim, near Khartum, as well as from the water-slope given in this work, and also in Table XXIV.; for if the Blue Nile flowed 300 kilometres up the White Nile, the mean annual discharge of the White Nile at Khartum would be greater, and not less, than at Taufikia, since at the former place both the Taufikia water and that which had flowed from the Blue Nile must eventually pass down.

The sketch of the development of irrigation in the earliest times will hardly be accepted as it stands by students of Egyptology. The Nile is described as widening and deepening its trough since the twelfth dynasty, but all available evidence goes to prove that it has been raising its bed at the rate of about 10 centimetres per century from at least as early a period as this.

Much of the chapter on projects for the utilization of water has previously appeared in other works by the author, and in discussing Sir W. Garstin's recent proposals, he would prefer the improvement of the Bahr el Jebel to cutting a new channel from Bor to the Sobat.

It cannot be said that this work furnishes a full account of the hydrography of the Nile, nor are all the statements made in it free from doubt; but it is much to be regretted that in such cases more proof is not given, and that no references or authorities are quoted. This alone will prevent it from becoming the work of reference for the Nile and its *regimen*, which Lombardini's essay was for years.

H. G. Lyons.

AMERICA.

A Feature of the Brazilian Coasts.

'The Stone Reefs of Brazil: their Geological and Geographical Relations, with a Chapter on the Coral Reefs.' By John Caspar Branner. (Bulletin of the Museum of Comparative Zoology at Harvard College. Vol. xliv. Geological Series, No. vii.) Cambridge, Mass., U.S.A. 1904.

Prof. Branner, in the course of his geological travels in Brazil, has devoted much attention to the "stone reefs" which fringe the coast. They are remarkable features, which can be paralleled only in the Levant and on the shores of the Red

seas. Usually not more than a few yards in width, and rising often only a foot or two above mean tide-level, they run often for several miles from headland to headland or across the bays. They consist of quartzose sand cemented by carbonate of lime, and have many points in common with the sand-spits and off-shore beaches seen on many exposed coasts. The best known is that which guards the harbour of Pernambuco, but excellent figures and charts of nearly all the best instances are given in this volume.

Coral reefs, also, are known in these seas, but have no close connection with the "stone reefs." Many problems arise regarding their origin and the manner in which their materials have been cemented together so that they can resist the direct attacks of the Atlantic surf. The author points out that the cementing action is confined to those regions where sea-water has nearly its maximum concentration. He believes that river waters, rich in dissolved lime-salts, percolating outwards through the porous sand-reefs, deposit carbonate of lime where they come in contact with the highly saline ocean-water. Prof. Branner's monograph is distinguished for the fulness of detail with which the subject is treated, and the caution with which inferences are made. Incidentally, it contains much interesting information regarding the Tertiary and recent deposits of the Brazilian coast and the changes of level there since Pliocene time.

J. S. F.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

An English Suess.

'The Face of the Earth.' By Edward Suess. Translated by Hertha B. C. Sollas, under the direction of Prof. W. J. Sollas, F.R.S. Vol. 1. Pp. xii., 604. The Clarendon Press. 1904.

Twenty years have now elapsed since the appearance of the first volume of Prof. Suess's 'Antlitz der Erde,' and the publication of an English translation within the last few months is at least a tribute to the originality of the author's conceptions and to the place which the book holds in geological literature. Most treatises on general scientific subjects are relegated to a back shelf long before they have reached this age. Although the delay in bringing out the book in an English version might seem to imply otherwise, it has always been warmly appreciated in Britain, and its author has been the recipient of many of the highest honours which English science can award him. Scattered through the literature of British geology and geography, innumerable references to the 'Antlitz der Erde' will be found, which show how deeply it has made its mark on current speculation regarding all the greater problems of dynamical geology and geographical evolution. At the universities Prof. Suess's work has always been much studied, and the British student is now to be congratulated on having so eminently satisfactory a translation at his hand. Apart altogether from the inherent difficulties of the subject, and the prodigious learning exhibited on every page, the book was by no means easy to read in the original, on account of the graphic and idiomatic German in which it was written. Few foreign writers in geological subjects have the profound and extensive knowledge of the literature of the geology of Britain and British possessions which Prof. Suess commands, and hence, in its new form, the book will certainly appeal to many geographers, travellers, and general readers who might not otherwise have been able to familiarize themselves with it.

The translation is a very successful one; clear, terse, and graphic, it has many of the literary merits of the original, and the occasional bursts of eloquence in which the author indulges have been rendered with considerable skill. The version

follows the original German edition, and while the orthography of some of the geographical names has been modified in accordance with English usage, a few of the woodcuts retain the German titles. In the French edition many additional illustrations were introduced, together with supplementary references to original sources of information; these make this version on the whole the most useful for geologists, but the task of adequately illustrating the 'Antlitz der Erde' is nearly a hopeless one. In some of the chapters the reader wanders through a maze of geographical names, and to follow all the descriptions in detail would involve the consultation of a library of atlases and papers. Then in a brief and vivid summary the results of the inquiry are brought to a focus, and the great principles involved stand forward in the clearest light.

In this volume we have a synthetic study of the mountains of the globe. The work begins with a general introduction in which the main lines of geological evidence are sketched—earthquakes, volcanoes, changes of level, faulting, and erosion; this includes a brilliant chapter on the Noachian deluge, which, it is argued, finds a rational explanation in a fortuitous conjunction of seismic and cyclonic disturbances over the plains of the lower Euphrates. The second part opens with a discussion of the Alps and the relation between the great system of Alpine folds and the stable platform of older rocks which lies to the north of them. This mountain system is then traced through the great hook-shaped curve of the Apennines into North Africa, and across the pillars of Hercules into the Betic Cordillera, while to the eastward it sweeps through the great semicircle of the Carpathians. The great sunken areas of the Adriatic and the Western Mediterranean are shown to lie within the mountain arcs, and the Tertiary history of the Mediterranean area is outlined in a brief but highly significant chapter. From Europe we proceed to Asia, and examine the great mountains which diverge from the upper valley of the Indus. The whole vast system of Tertiary folds is contrasted with the stable areas which lie to the north in Europe, Siberia, and China, and to the south in Central Africa and the Indian peninsula. Lastly, in two chapters, the mountains of the western hemisphere are briefly discussed.

Over this wide field the author ranges with consummate ease; his knowledge of the geological literature of the most distant countries is equalled by the skill with which he seizes on those facts which are of prime importance. It is his aim to show the harmony which underlies phenomena apparently discordant, and to point out the analogies in structure and history in the different mountain ranges of the world. Criticism may easily be directed on individual points, but the wide scope and philosophic depth of the main argument must impress every reader. No book has ever proved more stimulating in the best sense than the 'Face of the Earth,' and we return to it again and again with renewed enjoyment. It is to be hoped that the second volume will appear in English without great delay; the third volume has not yet been completed in the original edition.

J. S. F.

GENERAL.

The Position of Geography in Science and Education.

'Die Erdkunde: eine Darstellung ihrer Wissensgebiete, ihrer Hilfswissenschaften und der Methode ihres Unterrichtes.' Herausgegeben von Maximilian Klar. Leipzig und Wien: 1903-1905.

The necessity of placing the teaching of geography in intermediate education on a higher level than it stands now, is being very keenly felt in Germany and Austria. In proportion as the university teaching of everything connected with the study of our planet and its inhabitants attains an increasingly higher level in

the universities of these two countries, the need is being felt to raise the level of geographical education in the Gymnasia and Realschulen. At the same time, the demands which have been put before the teacher of geography have lately been widened on the continent so as to require from him acquaintance with a number of natural and anthropological sciences, while the question as to the methodics of geographical teaching altogether, and the general aims which it has to keep in view, has lately been the subject of thorough discussion at several geographical congresses.

The result has been to create amongst the teachers of the secondary schools in German-speaking Austria the need of a collection of text-books dealing, in a not too bulky form, with the diverse branches of geography and its auxiliary sciences, as well as with the methods of teaching. The outcome of this movement is the important work of which the title is given above. The intention of Prof. Max. Klar is to bring out a collection of some thirty different works, covering something like 5000 pages and costing about £6, which would deal with all the just-mentioned subjects in a condensed form. Such a work could evidently not be written by one man, and the collaboration of a number of men of science, some of whom are well known to the geographer, has been secured. Thus we notice among them Dr. Siegmund Günther ('History of Earth-knowledge'), Dr. Julius Mayer ('Heimat-Kunde'), Dr. Wilhelm Trabert ('Climatology'), Dr. Heinrich Schurtz ('Ethnology'), Dr. Alfred Kirchhoff, and many others.

In Prof. Klar's 'Erdkunde' the first two monographs are given to the history of geography and of geographical teaching. The methods of teaching are discussed next ('Methodics' and 'Heimat-Kunde'). Astronomical geography, the astronomical determinations of geographical co-ordinates, the nautical sciences, and chronology, form the contents of the next five parts. The next division is devoted to physical geography (including terrestrial magnetism), the earth's crust (a geological compendium for the geographers), the rivers and the ocean, meteorology, geo-botany, and geo-zoology. The sixteenth and seventeenth parts are devoted to ethnology and folk-lore, the eighteenth to geographical terminology, and the nineteenth to historical geography. The next two parts deal with political and economical geography. The methodics of topography and topography itself, geodesy, and cartography occupy the next three parts. And finally, in the last three parts, maps, reliefs, and other auxiliaries of geographical teaching are considered, as also geographical school collections; a separate fascicule contains problems that may be given for exercise in different portions of geographical teaching.

We have now before us seven parts of Prof. Klar's collection, and judging from them we can say that it will be most valuable for its purpose.

In a series like the geographical encyclopædia which we have before us, one has to direct his attention, first of all, to the work of Dr. Anton Becker, 'Methodik des Geographischen Unterrichtes. Ein pädagogisch-didaktisches Handbuch für Lehramts-kandidaten und Lehrer' (Part iii.). This small work of only ninety octavo pages will be found an extremely valuable aid by the teacher of geography. One might take exception to the too great importance attributed to Heimatkunde —the more so as the pupil of an intermediate school has necessarily already acquired in the primary school some knowledge of the aspects of the land, and will certainly acquire a greater interest in earth-knowledge by being told of distant lands and having pictures of distant landscapes shown to him. With the plentiful supply of illustrated periodicals, this would happen without the interference of the teacher. Therefore, the statement to the effect that "before all,

the fundamental conceptions of geography must be developed *only* from the contemplation of the locality," may be considered as too categorical. However, Dr. Becker gives so many references to the literature of the subject, that the reader may himself introduce the necessary limitations to the above statement. On the other hand, we find in the little work before us so much excellent advice given to the teacher, that we should be inclined to produce quite a number of quotations from it. Here is, for instance, one concerning the importance of the so-called "Kultur-geographie" as a means of general education—

"Nowhere does one find such an opportunity to point out the mutual interaction of geological, orographical, and climatic conditions, and their influence upon the conditions of human life and human work, as one finds here. The pupil has the possibility of getting a thorough acquaintance with a number of conceptions which are now continually referred to as 'war-cries' in our daily press. Here he learns about the different activities of man which are links of a great chain and serve the needs of all, as well as human progress as a whole. He learns to hold every sort of handiwork in esteem. While he gets an insight into the foundations of the economical state of a country, he learns not to over-estimate the conditions prevailing in his own country or abroad; and while he studies the economical conditions of a country, he obtains a clear comprehension of the history of its inhabitants."

Notwithstanding the compact size of this work, all the main points of geographical teaching, and the chief aids for this teaching—maps, globes, surveys, drawings, collections, etc.—are dealt with.

Part vii., "The Astronomical Determination of Geographical Co-ordinates," by Eugen Gelcich, will be most welcome to the geographer, as it deals with this important subject in a very thorough way, in a compact memoir of 126 pages. The different methods are treated without resorting to higher mathematics.

"Geodesy" (Part xxiii., 417 pages) is treated by Dr. Norbert Herz. This work was begun by Dr. H. Hartl, but was left unfinished by him at his death. As a text-book of elementary and higher geodesy the work of Dr. Herz has undoubtedly a great value, the different methods, as well as the instruments, being described with great lucidity, and illustrated by excellent diagrams, while those geodetical theorems which require the knowledge of the differential and integral calculus are not omitted, but are dealt with in small-type footnotes. Fully recognizing the necessity of such a detailed work in Prof. Klar's collection, we nevertheless ask ourselves whether a short summary of the subject, giving only a broad idea of the methods of geodesy, would not be equally desirable in a collection destined for the secondary schoolmaster. Moreover, we shall permit ourselves to point out that the unfortunately too-much-neglected measurements of altitudes might have been dealt with in some greater detail in the large work. A traveller who brings no hypsometrical material from the country he has explored, does not deserve the name of a geographer. Besides, something may also be said of the immense amount of enjoyment which can be obtained by schoolboys from altitude measurements during their pedestrian and cycling excursions. So we hope that this important subject will be dealt with in more detail under the head of topography.

Both volumes dealing with Ethnology and Folklore are already out. The former was written by Dr. Heinrich Schurtz, whose work on the secret class-organizations among savages was so much appreciated by specialists, but whom untimely death has carried away from our ranks during the printing of this last book in Prof. Klar's series. In the small space of 180 pages Dr. Schurtz

has given such an excellent compendium of his branch that it ought to be translated into all languages.

'Folklore: its Importance, its Aims, and its Methods,' by Dr. R. Fr. Kaindl, is an attempt to popularize this branch of research, and to define at the same time, in a scientific way, its proper methods of investigation and its relations to ethnology and anthropology. After having indicated what is being done in this direction in different countries, the author discusses the part that folklore plays in the development of our social conditions and the bearing of these studies on history. He concludes by giving detailed instructions and inquiries (some of them with explanatory drawings) for those who might undertake folklore studies, and finally discusses the scientific treatment of folklore materials, and the place of folklore in the school curriculum.

An extremely useful little work is that of J. W. Nagl on geographical names. The author, who is well acquainted with the already growing literature of this subject, gives explanations of geographical names with the Chinese, the Japanese, the Turkish stems, the Hebrews, the Phœnicians, the Magyars, and all European nations, and he deduces the general rules which may be observed in the formation of geographical names with different nations.

An important part of Prof. Klar's 'Erdkunde' is the volume (300 pages) given to Historical Geography by Dr. Wilhelm Götz. The author fully understood the impossibility of adequately dealing with this immense subject in a small volume, the more so as the very foundations of this branch of science are not yet settled. Therefore he only undertook to give a series of illustrations of the influence of geographical surroundings on the historical development in different regions of the Earth. One series is taken from the history of Middle Europe, and the other from the Mediterranean region. As a first attempt in this direction the work of Dr. Götz deserves full praise; but we must point out that the conquests of the forests and marshes of Middle Europe by man in the barbarian period, the influence of the village community, and especially the conquest of the country for civilization that was accomplished by the mediæval cities, are not brought sufficiently to light. It must also be said that none of the general preparatory works which are mentioned by the author could have been a safe guide in this branch of knowledge, which requires yet a great deal of original research. We hope, however, that the forthcoming large work of Elisée Reclus, in which man and his geographical surroundings are discussed at length, will be epoch-making in this direction.

We shall not fail to mention the other parts of Prof. Klar's great undertaking as soon as we have received them.

P. Kropotkin.

THE MONTHLY RECORD.

EUROPE.

The Underground Waters of North-West Yorkshire.—The report of a joint committee of the Yorkshire Geological and Polytechnic Society and the British Association, formed for the purpose of continuing the investigations carried on by the former body on the underground waters of north-west Yorkshire, is printed in the *Proceedings* of that society for 1904 (N.S. vol. 15, pt. 2). The bulk of the report has been prepared by Mr. A. R. Dwerryhouse, on whom the greater part of the arrangements for the prosecution of the work devolved, and who gives both a general sketch of the geography and geology of the district investigated

(that around Ingleborough), and a summary of the results obtained as regards a knowledge of the circulation of the underground waters. Ingleborough, as is well known, forms an almost isolated patch of high ground, separated from surrounding hills by deep valleys, and the area offers advantages for an investigation of the character in question both for this reason, and because of the large number of streams which flow in part beneath the surface. The summit consists of millstone grit resting upon a series of shales with thin limestones and grits (Yoredale rocks), which in turn overlie 600 to 700 feet of mountain limestone. This rests unconformably on a floor of Ordovician and Silurian rocks, the surface of which consists of a series of ridges with intervening valleys. The rain falling on the porous millstone grit percolates through its mass until it is thrown out, on reaching the underlying shales, as a series of springs, the water of which is again absorbed into the fissures of the limestone, and again issues at its base. The flow of the underground waters was tested by the introduction of various substances into the water-sinks (fluorescein being found by far the most satisfactory), and the connection between the points of disappearance and emergence was satisfactorily determined in many cases. Thus, in the case of the famous Gaping Ghyll, a direct connection between this and the spring at Clapham Beck was established, the water being found, at the time of the experiment, to take five clear days to pass along its underground course over the mile that intervenes between the two points. The report gives a detailed description, with maps and sections, of the various "pots" and other features, the general conclusion as to the flow of the waters being as follows: The flow is radially outward from the high ground, but is profoundly affected by the direction of the joints in the limestone. These usually pass through one bed only, but occasionally, as in Mere Gill hole, the limestone is fractured from top to bottom. The irregularities in the floor of Silurian and Ordovician rocks form underground watersheds which may determine the direction of flow. Some, at least, of the caves and pot-holes are of pre-glacial origin, since it has been found that the original outlet (as, *e.g.*, in the case of Alum pot) was in an old valley now partly filled with glacial drift. Owing to the influence of the joints in the limestone, there are instances in which streams are carried beneath a surface watershed, to emerge in a different drainage basin from that in which they took their rise, while crossings of streams at different levels also occur.

The Midlands Earthquake of April 23.—An earthquake of considerable strength visited the north midland counties on the morning of Easter Sunday at about 1.36 a.m. The epicentre probably lies in the district where the counties of Nottingham, York, and Lincoln meet, and not far from Doncaster and East Retford. The disturbed area includes the whole of the counties of Lincoln, Nottingham, Derby, Leicester, and Rutland, and the greater part of Yorkshire, Staffordshire, and Northamptonshire, and even extends into Lancashire, Warwickshire, and Norfolk. A first estimate gives the extent of the area shaken at 20,000 square miles. Some slight damage to buildings is reported from the neighbourhood of the epicentre, and the Great Northern Railway station at Doncaster was somewhat seriously injured. "For about 50 yards on the up side the roof of the platform and the smoke-box over the nearest line of rails became partially detached, the pillars supporting the smoke-box leaning towards the metals, and the pillars supporting the platform roof leaning towards the station buildings to a total extent of about 8 inches." Most of the seismographs in this country are affected only by the long-period waves from distant centres, and therefore failed to register the disturbance, with the exception of an Omori horizontal pendulum at Birmingham, which recorded a series of minute tremors lasting altogether for about a quarter of a minute. The earthquake is being investigated by Dr. C.

Davison (16, Manor Road, Birmingham), who would be glad to receive accounts of the shock from any part of the disturbed area.

The Earthquake in France and Switzerland on April 29.—At about 1.45 a.m. (Greenwich mean time), a shock, comparable in strength with some of the strongest experienced in this country, was felt in the south-east of France and west of Switzerland. The epicentre appears to be in Savoy, in the neighbourhood of Chamouni and Argentière, where the walls of many houses were cracked. That the damage was not excessive, however, is evident from the fact that in this district it is estimated to amount to no more than £4000. The disturbed area contains not less than 50,000 square miles, extending from Basle to near Aurillac, and from the neighbourhood of Nevers and Dijon to Turin and Domodossola. The shock was recorded by seismographs at Heidelberg, Pavia, Padua, Ferrara, Modena, Ischia, and elsewhere.

The Simplon Tunnel.—The economic bearings of the Simplon tunnel are discussed in Mr. Sargent's article in the present number (*ante*, p. 654), which, however, is not concerned with the technique of the great undertaking, or the relation of the tunnel to the physical features and geological structure of the region through which it passes. A few notes on these points may therefore be given here. The tunnel differs from other great Alpine tunnels in its comparatively low level, no attempt being made, as, *e.g.*, in the case of the St. Gothard, to attain, by means of engineering feats, an elevated point of vantage for the attack of the mountain range. It leaves the Rhone valley just above Brieg, at an elevation of only about 2260 feet above the sea (the northern entrance to the St. Gothard tunnel is at a height of 3380 feet), and strikes south-east by a straight course for the Italian village of Iselle, in the Val di Vedro (above Domo d'Ossola), where it makes its exit at an elevation of 2080 feet. One result of this low level is the immense length of the tunnel, which places it at the head of all tunnels yet pierced in this respect. It reaches 21,577 yards, or just over 12¼ miles, as compared with 16,393 yards (9¼ miles) in the case of the St. Gothard, and 13,279 yards (7 miles 959 yards) in that of the Mont Cenis. The Simplon road, in the wide circuit it makes to the south-west, diverges a long way from the line of the tunnel, the nearest point of which is over 3 miles to the north-east of the Simplon pass. The highest point of the surface immediately over the tunnel (about 9000 feet) is on the Swiss-Italian frontier, close to the Furggenbaum pass, but the summit of Monte Leone (11,683 feet) lies less than a mile off the direct line. An excellent sketch of the geological structure of the range at this point, and especially of the circulation of the underground waters which have formed one of the greatest difficulties to be overcome during the construction of the tunnel, was given in *La Géographie* for February, 1905, by Prof. H. Schardt, one of the expert advisers employed by the Swiss Government. A geological section there inserted shows the exceedingly complicated arrangement of the geological formations, which may be subdivided into three groups. To the north is a zone of Jurassic schists (*schistes lustrés*) pierced here and there by dolomitic limestone of Triassic age. In the centre is a much contorted mass of crystalline schists and gneiss (with intercalated calcareous schists, etc.), forming the upper part of the Monte Leone massif. To the south, again, there is another zone of gneiss (that of Antigorio), which has hitherto been thought (erroneously) to compose the core of the massif. As a matter of fact, the Monte Leone gneiss lies in a basin formed by the *schistes lustrés*, such have been the contortions to which the formations have been subject. The circulation of the underground waters at great depths has been found to be closely bound up with the fissuration of the rocks, and the most copious springs almost always issued from soluble rocks, especially the limestones. The temperature of the

rocks was found to be profoundly affected by the circulation of the water, which frequently had the effect of lowering the normal temperature, so that the highest encountered was not beneath the culminating point of the surface, but at a point some distance to the north-west, whither little water had found its way. In the zone of most copious springs, in the southern segment of the tunnel, temperatures of 63° Fahr., and even 59° were found, where they would normally have been as high as 95° to 100°. Many springs, of which the volume was at first great, gradually decreased until a permanent discharge was reached, the mineral constituents, and frequently the temperature also, showing a similar decrease. This is explained by the fact that the water in the lower parts of the fissures had been more or less stagnant, until drained away by the piercing of the latter. From a careful study of all the springs observed (there were over forty in each of the parallel galleries), Prof. Schardt divides them into three groups: (1) hot springs, at a temperature higher than that of the rock, and tending to increase with time; these are strongly impregnated with gypsum and iron; (2) springs at about the temperature of the rock, always more or less ferruginous, but varying as to the amount of gypsum; (3) cold springs, very copious, with little iron, but much gypsum. He describes in detail the method of circulation and the temperature régime of the several classes. An important point brought out is the fact that with the *decrease* of rock-temperature owing to the access of water at one point, there is an *increase* in parts abandoned by the water, so that a general thermal balance is maintained.

Northern Germany as known to the Ancients.—An interesting study of the gradual acquisition of knowledge of Northern Germany by the Greeks and Romans has been brought out by Herr D. Detlefsen in the valuable series of monographs ('Quellen und Forschungen zur alten Geschichte und Geographie,' No. 8: Berlin, 1904) edited by Prof. Sieglin of Berlin. The author is already known (among other writings on historical geography) for his edition of the 'Natural History' of Pliny, one of the most important bases for the present study; but he now presents a comprehensive general view of the subject, as elucidated by a comparative study of all the early writers who have touched upon it. He gives many references also to modern German authors who have worked in the same field, though the views of writers in other languages (*e.g.* Bunbury in English) are not discussed. In many instances he brings forward new explanations of doubtful questions, which though sometimes rather venturesome, have generally much in their favour, the authority for the *variæ lectiones* of the old texts being carefully weighed. Among the most interesting points discussed is naturally that of the information given by Pytheas on these northern regions. Like Bunbury and Sir C. Markham (*Journal*, vol. 1, p. 519), the author considers the "æstuarium oceani" of that voyager to be the portion of the North sea washing the German coast, the phrase used corresponding well with the "Wattenmeer" of the Germans. The name of the dwellers on this coast ("Guionibus" of Pliny, according to the best MS.) he explains plausibly as identical with the "Inguæones," elsewhere placed by Pliny in the same region; holding that the reading "Gutonibus" is unsuitable, since no early account places the Goths in this region. The first syllable of the word would seem to have been first taken for the preposition *in*, and afterwards dropped out as a meaningless interpolation. For the name of the estuary he adopts the reading "Metuonidis" in the place of the more commonly accepted "Metonomon," and ingeniously derives the word from the "matte" or "mede" (meadow), which is a common element in the place-names of this region, the termination *-is* being that commonly used by the Greeks to designate a region. The island of Abalus, whence amber was obtained, is identified with Heligoland, which was once

much larger than it is now. The Basilia and Baunonia of Timæus are both considered identical with the Abalus of Pytheas, while the Basilia of the latter was a more remote land, of which only a vague rumour had reached him. Other Greek navigators followed Pytheas, and of their voyages we seem to have an indication in the fabulous stories related of men with ears large enough to cover them, and the like. The accounts of Xenophon of Lampsacus show a widening horizon, and in his Balcia, as well as in the Basilia of Pytheas, we seem to have an indication of southern Sweden, long considered to be an island. His "Lutmiorum insula" is considered, with some show of reason, to be a misreading for "Latriorum," *i.e.* the "Latris" elsewhere spoken of by Pliny as an island to the east of the Cimbrian peninsula. The next important authority was Philemon (about 100 B.C.), whose lost work probably described the whole of Northern Europe, and who knew of the northern part of Jutland, the sea bathing its shores ("Morimarusa"), and probably the southern extremity of Norway. Eastward his knowledge seems to have extended to the amber region of the Samland. We next hear of the Codanus Sinus with the island of Scatinavia, or Codannovia, the name Codanus being somewhat boldly identified with the Katte(n)gat, while the island no doubt once more represents southern Sweden. The puzzling statement of Pliny that its inhabitants, the Hilleviones, called it a second world, is plausibly explained as really referring to the ideas of the Greeks, thus showing an analogy with the current notions regarding Taprobane. From this time onwards new names are constantly occurring, the Greeks having now given place to the Romans as explorers and chroniclers. The paper concludes with the picture of these regions supplied by Ptolemy.

ASIA.

Sechuan.—In a report ('China,' No. 5, 1904) extending to 101 pages, and supplemented by two maps, Consul-General Hosie embodies a comprehensive and detailed account of the agricultural, animal, and mineral products, raw and manufactured, of the province of Sechuan. Incorporating much that is new, and marked throughout by the use of first-hand information, the paper is the best guide to the whole material economy of the province that has yet appeared. Of the province, 167,000 geographical square miles in area, constituting one of the richest portions of the Chinese Empire, the western half is very mountainous, sparsely peopled by aboriginal tribes, and little cultivated except in its valleys, into which the Chinese have penetrated. The eastern half constitutes the "Red basin," having a thick surface layer of red and grey or yellow sandstone. It is surrounded by high mountain ranges, through which the Yangtze, forcing an eastern passage, has carved magnificent gorges. With the exception of the plain of Chengtu, 90 by 40 miles, there is very little level ground. Its valleys rise in many places to over 1000 feet above sea-level. One of the most valuable assets of Sechuan is salt, found everywhere, but most richly in the Red basin at depths of 30 to 2000 feet. Besides satisfying its own requirements, the province also exports an immense surplus. The most populous part is the plain of Chengtu, comprising seventeen cities, the population all the same being essentially rural. All eastern Sechuan is dotted with farmhouses, hamlets, villages, and market towns. The population of the capital is estimated at 500,000; that of the province at 45,000,000. The climate is exempt from extremes. In summer 95° Fahr. is a fair average maximum; in winter the temperature seldom falls below 35°, frost being very rare. There are light rains in January, February, and occasionally March and April; heavier rains, beginning in May, continue through June and July. The rainfall needs, however, to be supplemented by irrigation, the methods of which are lucidly described. No less necessary is manuring, for which everything possible

is utilized. Rice is the most important food-crop, and its granary is Chengtu plain with its never-failing water-supply. Red rice is cultivated in the mountainous districts. Glutinous rice, 11 per cent. dearer than ordinary rice, constitutes 20 to 30 per cent. of the total rice cultivation. From it are manufactured sugar, toffy, and a weak spirit. Next in importance to rice is wheat. The best flour is manufactured in Mien-chu Hsien, north of Chengtu plain. Barley is cultivated in the hilly regions more for spirits, ferment, and cattle-feeding than for human food. Other cereals are millet, Italian millet (*Setaria ital.*), a summer hill crop for feeding birds, maize, buckwheat, oats, pearl barley, and another grain which the report calls *Panicum Crus-galli*, L. Most of these cereals are made also into spirits. Next to cereals in importance for feeding the population is pulse. A list of forty different fruits is given, with their centres of production. The medicines of Sechuan recall the heterogeneous mixtures current in mediæval and later Europe. To pass over the vegetable medicines, 189 of which are enumerated, there figure among the animal medicines "Exuviæ of cicadæ," "dried silkworms," "cockroach dung," and other like choice ingredients. The chief obstacle to the prosperity of Sechuan is the difficulty in the way of the rapid disposal of its products. Steam communication on the upper Yangtze from Ichang to Wan Hsien is pronounced impracticable. Junk communication, on the other hand, labours under necessarily heavy freights, under which a case of kerosene oil, *e.g.*, selling in Hankau at $3.40, costs in Chengtu $10.30, and a tin of sugar worth 60 cents in Shanghai costs $3.40 in Chengtu.

Early Mapping of Korea.—In connection with the note on this subject in the April number (p. 456), a correspondent calls attention to the documents on Korea printed by Hakluyt in his 'Principal Navigations' (Maclehose's reprint, vol. 11, p. 422), in the title to which it is stated that the country was "called by the Portugales Coria, and by them esteemed at the first an iland, but since found to adjoyne with the maine not many dayes journey from Paqui, the metropolitan citie of China." This makes it the more singular that the Dutch cartographers, who based their map of this region on Portuguese sources, should have held so long to the erroneous representation of Korea as an island. It also exemplifies the up-to-date nature of the information collected by Hakluyt.

AFRICA.

The British East Africa Protectorate.—The report of Mr. Hobley on the East Africa Protectorate for 1903–4 ('Africa,' No. 15, 1904) records, on the whole, satisfactory progress. It is shown that the most striking features of the year were the influx of European settlers into Kikuyu, the rift-valley, and Mau highlands, and the growing prosperity of Kisumu and Kenya provinces. The rainfall during the year in certain parts of the protectorate was above the average, notably in the region between Nairobi and the lake and in the Lumbwa country, while in the district below Nairobi a deficiency in the rainfall is recorded. Sleeping sickness is still prevalent round the shores of Lake Victoria, and appears to be extending south in the direction of German territory. The township of Kisumu has been removed to the south side of Ugowe bay, many new buildings having been constructed and roads made in the vicinity. Much, however, remains to be done to improve the health of the place. Two new stations have been constructed in the Kisumu province—one at Karungu, to open up the Ugaya district, and the other at Soba. With regard to trade, a decrease in imports is notified, mainly due to the difference in Government goods, while a steady increase in exports is recorded. A Forest Department was organized during the year, and progress has been made in the work of demarcating and examining forest areas and establishing nurseries in different

parts of the protectorate. Appended to the present issue is a series of valuable reports, one dealing with the subject of sleeping sickness, and the others with the agricultural capabilities of the several districts of the protectorate. The soil of the rift-valley is described as good dry grazing land, more suitable for stock-raising than for crops, although during the wet season it is thought that wheat, maize, and potatoes, etc., might be successfully grown. On the other hand, the Mau plateau, possessing a richer soil and heavier rainfall, seems better suited for the production of crops. The best lands for settlers in the rift-valley appear to be those on the Mbaruk river and on the south of Lake Nakuru. The Tsavo plateau, stretching towards Kilimanjaro, is said to be a locality of great promise both for agricultural and stock purposes. The country in the neighbourhood of Fort Hall, in the Kenya province, seems well adapted to agriculture, and worthy of the attention of cotton-growers.

M. le Roux's visit to Lake Zuai, Abyssinia.—The inhabitants of the islands of Lake Zuai, as is well known, long maintained a semi-independence of the Abyssinian Negus under a chief of their own. In his endeavours to establish his supremacy in all parts of his wide dominions, Menelik in 1894 sent an army against these people, with the result that their resistance was speedily overcome and their king taken as a prisoner to Addis Ababa. With a view to still further establishing his influence, Menelik confided a mission to the French writer and traveller, M. H. le Roux, to visit the lake, make a study of the people, and report on the antiquities preserved among them, on the possession of which their claim to independence, based on a traditional connection with King Solomon, largely depended. In spite of the opposition of the priests, M. le Roux, who lately gave an account of his journey before the Paris Geographical Society (*La Geographie*, 1904, No. 1), was able to visit the islands and examine their churches and the palace of the king. The lake is impregnated with soda, and this is at times so abundant that the fish in it die. At sunset the water shows violet and mauve tints, which contrast strongly with the reddish soil of the shores and islands. Of the latter the three principal lie towards the south-west, and are of eruptive origin. Their names are Haisut, Famat, and Debra Sion (Mount Sion), called also Princesses' island. Fig trees, euphorbias, etc., grow on the islands, where cotton is also cultivated. Goats, sheep, and a few cattle are kept. The population of the islands is at present from 4000 to 5000 souls, though formerly it reached 15,000. All speak the "laki" or rowers' language, a mixture of Abyssinian and Tigrean, but two races are represented, the first of which, the Wato, still pagans, recall the ancient Egyptians as shown in the papyri. Tradition has it that they migrated from Egypt in the time of Joseph. The other race is related to the Gurage, and is said to have come from Tigre about 340 B.C. It reproduces the purest Jewish type. One only of the churches was open, the others having been closed since the deportation of the king. The inner meaning of Christianity has been quite lost, and the religion is a sort of exalted fetishism. The manuscripts in the possession of the priests are the Gospels and other religious or historical books. In the palace a fire has been kept constantly burning since the king's departure, and his return is earnestly prayed for by the people.

AMERICA.

Internal Commerce of the United States.—An article contributed by Prof. Hauser to the *Annales de Géographie* (No. 73, XIV. Année) on the "Internal Commerce of the United States" is noteworthy, not so much as a summary of facts, as for its causal elucidation of the varied factors which come into play. The magnitude of the land, it is pointed out, imposed on the nation appropriating it the

problem of conquering space—a problem solved in the first place by the railway. Another fact to be reckoned with was the variation of its soil and climate—the vast cultural zones each extending over an area not to be measured by European standards, and devoted almost exclusively to one or two cultures. It is shown how in France the elements of human life are not rigorously differentiated over widely separated localities, but are as a rule intermingled locally, so that the products of France are interchanged internally between places near one another, or at farthest but 600 miles apart. While France has thus in itself all the necessaries of life, the United States, of sixteen times the area of France, does not form sixteen Frances, each capable of independent economic development. Had such been the case there would have been no federation, or none of any permanence. Each unit would have followed its own development and constituted a state by itself. It is the pronounced specialization in production of its diverse regions and their consequent inter-dependence that has determined the union. Embodying all climates, and so all products, the United States could afford to be independent of the outer world. Its inter-state trade is therefore thirteen times the value of its foreign. Hence its protection and its felicitous indifference for nearly half a century to the development of its mercantile marine. In their no less strict causal connection the article sets forth the respective directions and volumes of the internal currents of commerce, the exploitation of navigable ways, the history of development of the great railway lines, and of the coasting trade. With the growth of population already tending to approximate to the rate of the growth of commodities, with the increasing demand for luxuries and extra-American products, and with the enormous increase of industrial production demanding oceanic trade, the period during which its internal trade has constituted the predominant note of the economy of the United States seems, to the writer of the article, to be drawing to a close. Though the scope of the article does not include an appreciation of the reaction of America on its colonizers, the reciprocal relation between man and geography constitutes the thread running through the whole, and linking together all the data put forward.

Dr. Hoek's Exploration in Bolivia: Erratum.—*Geographical Journal* for May, p. 500, illustration, for "Quebrader" read "Quebrada."

AUSTRALASIA AND PACIFIC ISLANDS.

Dr. A. Agassiz's Cruise in the Pacific.—News has just reached this country that Dr. Alexander Agassiz has completed his great cruise in the Eastern Pacific in the *Albatross*, alluded to in the May number of the *Journal*. He joined the ship at Panama on November 2, 1904, and returned to San Diego, California, on March 12, 1905, having been at sea for over one hundred days. During this time he ran some important lines of soundings across a part of the Pacific where information regarding the depth of the ocean was much required. He took some very good serial temperatures developing the Humboldt current, which carries with it most of the pelagic forms of life. Where there was no current there was no pelagic life to drop to the bottom, and, indeed, outside the Humboldt current far from land he found very few Benthos organisms. He discovered a ridge between the Galapagos islands and Manga Reva, which he named "Garrett ridge," after the commander of the *Albatross*. A large stretch of the ocean floor in the region between the Galapagos and Easter inland and Callao was found to be covered by manganese nodules to such an extent that he was quite overwhelmed with them. Where the manganese nodules occur comparatively little was brought up in the trawl. In fact, this manganese nodule area, and the similar area traversed by the *Challenger* farther to the west, may be put down as the desert regions of the ocean. All the samples of bottom muds collected are to be forwarded to the Challenger Office in Edinburgh for examination and description.

A Primitive Tribe in British New Guinea.—In the Annual Report on this possession for 1902–3, the item of most interest geographically is an account of a visit by the acting administrator to a small tribe, the "Agaiambo," inhabiting a series of swamps not far from the lower waters of the Barigi river, in the north-eastern division. Two of their villages were sighted, and one man and a woman induced to leave their boat and step on shore. Once fairly numerous, the tribe has been recently reduced by an epidemic to about forty persons. Never leaving their morass, their feet bleed in the attempt to walk on hard ground. From time immemorial they have been living in this swamp. The man who landed had a good chest, thickish neck, and arms to match, but the lower parts of the body, especially the legs, were disproportionately small. The feet, short and broad, were very thin and flat, with weak-looking toes. In the woman, the toes, long and slight, stood out, apparently jointless, from the foot. The man's skin above the knees was in loose folds, and the sinews around the knee ill developed. The muscles of the shin were much better developed than those of the calf. Placed alongside a Barugi native of the same height, the marsh-man was about 3 inches shorter at the hips. In figure and carriage, the man looked more ape-like than any human being the administrator had ever before set eyes on. The woman, of middle size, was more slightly formed than the man, but her legs were still short and slender in proportion to her figure. The houses of the nearer village were built on piles, at a height of about 12 feet from the surface of the water, but one house, at a village three-quarters of a mile off, was 3 or 4 feet higher. Small, long, and narrow, with no outrigger, their canoes are hollowed out to a mere shell for the sake of buoyancy. Aquatic plants in the water would oppose the progress of craft of any width. Though the canoes are of the round form of the log and very unstable, the owners pole them along easily, standing up in them. The people are expert swimmers, and live on wildfowl, fish, sago, and marsh plants, and on vegetables procured from the Barugi in exchange for fish and sago. They keep a few pigs on platforms built underneath or alongside their houses. Their dialect is the same as that of the Barugi. The report gives, on the whole, a satisfactory account of progress in the matter of trade, communications, and the like.

POLAR REGIONS.

The Scientific Results of the Swedish South Polar Expedition.—The prospectus has been issued in Stockholm of an important publication dealing with the scientific results of the Swedish expedition under Dr. O. Nordenskjöld to the region of Graham's Land in 1901–1903. The observations made by the scientists of the expedition were, as is well known to our readers, very extensive and important, and geographers will welcome their publication in a style befitting their value. According to the proposed arrangements, the work will form seven quarto volumes, extending to at least 3000 pages, with a profusion of maps, diagrams, and plates. Of these, vol. 1 will contain the general description of the voyage, the more strictly geographical results, and those in the field of terrestrial magnetism, etc. Vol. 2 will deal with meteorology; vol. 3 with geology and palæontology; vol. 4 with botany and bacteriology; and the last three with zoology. The work will appear in sections, each embracing one monograph, and it is to be completed by 1909. A part of the expense will be borne by the Swedish Riksdag, but as further funds will be necessary, the work will be issued to subscribers at the price of £15.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

The Determination of the Longitude between Greenwich and Paris in 1902.—That there should exist at the present time any uncertainty as to the

correct difference of longitude between the Greenwich and Paris observatories will be a surprise to most persons, yet such is the case, although the limit of possible error is, of course, extremely small. The determination of 1888 gave a resulting difference of longitude of 9m 20s·85, and that of 1892 9m 20s·79, the discrepancy between the two being 0s·06 of time, or 0″·9 of arc, which is equal to a distance of about 63 feet. In view of this discordance it was decided at the International Geodetic Conference of 1898 that a redetermination was desirable, and it was arranged by M. Lœwy of Paris and the Astronomer-Royal at Greenwich that this should be undertaken by the two observatories of Paris and Greenwich; but, owing to other important work on hand, it was found impossible to carry out the project until 1902. An interesting account of the manner in which the redetermination was conducted is given by the Astronomer-Royal in the *Monthly Notices of the Royal Astronomical Society* for January last, in which are described the instruments used and the observations made by the two English observers, Mr. Dyson and Mr. Hollis, who had been specially selected for the purpose. The results of the two French observers, MM. Bigourdan and Lancelin, were given in the *Comptes Rendus*, vol. 139, p. 1014, and found to differ only by 0s·042 of time from that obtained by the English observers. The instruments used were the four portable reversible transits belonging to the Royal Observatory, which had been used on the previous determinations, and the observing stations were the Transit Pavilion and an adjacent wooden observing hut in the front court at Greenwich, and stations in the grounds south of the observatory at Paris, a little to the east of Cassini circle. To ensure the best results, each observer took observations both at Greenwich and Paris, but kept the same instrument throughout. The observations were made in the spring and autumn of the year, and extended over thirty-nine nights between March 17 and May 3, and forty-one nights between September 21 and November 4. The clocks used were the standard sidereal clocks of the two observatories, and the time of transmission in one direction of the telegraph signals was found from the mean of the spring observations to be 0s·021, and from the mean of the autumn observations 0s·022. Every possible precaution was taken to ensure accuracy, and the agreement in the results is as satisfactory as could be expected. The differences of longitude obtained by the English observers are as follows: spring observations, 9m 20s·977—probable error, ±0s·011; autumn observations, 9m 20s·911—probable error, ±0s·004. Applying the proper weights to the spring and autumn series of observations as above, and taking the resulting mean, the final difference of longitude between the Greenwich and Paris observatories becomes 9m 20s·932, with a probable error of ±0s·006, while the final resulting difference of longitude obtained by the French observers is 9m 20s·974, with a probable error of ±0s·008. The difference between the two being only about 43 feet.

American and Austrian Research in Geomorphology.—We are indebted to Dr. K. Peucker, of Vienna, for a cutting from *Die Zeit* for April 15, 1905, containing an article by Prof. Penck on recent geomorphological research carried out under the auspices of the Carnegie Institution in Washington,* especially that of the expedition under Prof. Bailey Willis in Eastern China. Prof. Willis has, since his return from China, been entrusted with the execution of further research into the history of European mountain ranges, and has lately visited Vienna in prosecution of his commission, giving some account of his work in China at a gathering of Viennese geographers, at which Dr. Cvijić was also

* The expeditions to Central Asia under Professors Pumpelly and Davis and Mr. E. Huntington have, it will be remembered, been also supported by this active institution.

present.* Prof. Penck expresses his admiration at the work accomplished by Prof. Willis's expedition, which paid especial attention to the form and structure of the mountains of Shantung as well as of the Wutai-shan and the Chinling ranges. A most minute plane-table survey of the region traversed was carried out by Mr. Sargent, of the United States Geological Survey, with the result that our knowledge of the topography of Eastern China has received valuable additions. Prof. Willis belongs to the school which assigns to vertical movements of the Earth's crust, rather than to folding, a predominant *rôle* in the moulding of mountain ranges as they at present exist, and he holds that the mountains of Eastern China form the remnants of an old warped mountain stump which has been quite recently elevated and subjected to the furrowing action of streams. This last uplift is, as regard portions of the area, placed *after* the deposition of the loess, which is held to have taken place during the glacial epoch. Prof. Penck points out that many of the American conclusions in regard to the history of mountain ranges have been reached independently by the Vienna school of geographers, who have for some time been devoting their attention to similar problems. Thus he himself had, at the St. Louis Congress last year, put forward a somewhat similar explanation of the history of the western Alps, while at the discussion which followed Prof. Willis's address there was a general disposition to regard many of the European ranges as the stumps, as it were, of old mountain systems newly elevated, with the accompaniment of dislocation and warping, though this has not yet been shown to be true of the Alps. It should be observed, however, that even in America the views of the new school have not yet met with universal acceptance, and that the possibility of a different explanation in certain cases does not seem excluded.

GENERAL.

An Oceanographical Course at Bergen.—For several years courses of instruction on oceanography have been held under the auspices of the Bergen Museum during the University vacation (August to September), and have been attended by scientific men from various countries. It has now been decided to continue these courses regularly, and that for 1905 will be given between August 8 and October 14, consisting, as before, partly of lectures, partly of practical instruction and assistance in laboratory work. Excursions for the practical demonstration of appliances and instruments will also be arranged. Those wishing to attend are requested to apply before July 1 to The Oceanographical Institute of Bergen Museum, Bergen, Norway. The fee charged (75 kr.) is roughly the equivalent of four guineas.

OBITUARY.

Paul Lessar.

THE announcement of the death of M. Lessar will be received with regret by his many friends in this country. The name of Paul Lessar has of late years been so intimately associated with the stormy politics of Asia, that his eminent services in the field of geographical research are apt to be overlooked. He was born in Montenegro in 1851, and educated at Petersburg as an engineer. It was as an

* Prof. Willis has planned a journey to the "Iron Gates" and in the Balkan peninsula in company with Dr. Cvijić.

engineer that he was attached to Skobeleff's staff in Turkestan in 1878, to study the country in the interests of railway development. He was the first European scientist to carry explorations into the Trans-Caspian provinces with Komaroff in 1881, and subsequently, as agent to the governor-general of these provinces, he made a reconnaissance of most of the districts touching the Afghan border, penetrating to within a few miles of Herat.

This was accomplished at a time when the Perso-Afghan borderland was still subject to periodic raids by Turkman horsemen, and Lessar's adventurous rides across the frontier were attended with great personal risk. The result was the acquisition of that special geographical knowledge which, before the advent of the Russo-Afghan boundary commission in 1883 under Sir Peter Lumsden, gave the Russian Government such advantage in those political negotiations which ended in the appointment of the commission. During these negotiations Russian diplomats held the best of the trumps owing to their unchallenged information as to the geographical conditions prevailing in the disputed country, and this advantage proved to be almost disastrous to British and Afghan interests. Whilst the British Commission was waiting on the Russian Commission in the border country to the north of Herat in 1883–84, Lessar was well employed in London as an active agent in furthering the interests of the country of his adoption. Finding (as he explained to the writer) that "the politics of the average Briton in the afternoon were what he read in the paper in the morning," he made use of his pen and of his knowledge of the English language, and he succeeded in producing a marked effect on the politics of the Government of the day. The incident of Panjdeh was overlooked, and with it practically ended the mission of Sir Peter Lumsden, who was then recalled. It was subsequently that the protocol of September 10, 1885, was framed, laying down the line of the Russo-Afghan frontier, and with the succession of Sir West Ridgeway to the command of the British Mission the work of demarcation was at length commenced. It was as the political adviser of the Russian Commission that the writer first made the acquaintance of Paul Lessar, an acquaintance which ripened into a friendship, which lasted till the death of the Russian diplomat at Peking about a month ago. M. Lessar was a well-read and charming companion. He had that sincere liking for Englishmen which is common to most Russian gentlemen, and he was ever ready to explain his views as to Russian progress in Asia with the utmost candour. Naturally he regarded Russia as the final predominating power in the Asiatic continent; but he was content to regard this eventuality rather as an inevitable development in future history than as likely to be effected by any forcible expansion in the present. He was never an advocate for forcible measures. He even looked forward to an *entente* between Russia and England as a matter of mutual advantage, and was undoubtedly sincere in the professions of his belief that the linking together of commercial interests by the junction of the railway systems of Russia and India would inevitably promote peaceful relations between Russia and England. Community of interest was his panacea for present friction. He constantly expressed his regret that Englishmen travelled so little in Russia, and that they accepted the principle of antagonism to Russia as an article of national faith without troubling themselves to inquire whether the basis of it (the natural and inevitable expansion of Russia in Asia) really justified their convictions. There can be no doubt that the war between Russia and Japan was none of his making. As Russian minister at Peking (to which post he succeeded in 1901 from the appointment of Councillor at the Russian Embassy in London), there is every reason to believe that he would have averted that disaster had his advice been followed. Doubtless the results of that war proved to be bitterly disappointing to

so keen an advocate for the extension of Russian influence, and may have hastened his end; but he had never been in sound health since the days of privation and anxiety which he passed on the Herat frontier. The operation which resulted in his death would have been inevitable sooner or later, and he was well aware of it years ago. Paul Lessar had many friends in England, and few enemies; his friends will regret him deeply, and geographers will remember that with him has passed away the pioneer of exploration in that great lone land which stretches itself in sandy steppe and rugged upland from Herat to the Caspian sea.

T. H. H.

The scientific work of P. M. Lessar was well analyzed in 1884 by General Stubendorf, when the Russian Geographical Society awarded to the Transcaspian explorer a gold medal. In 1881 he was working in the Transcaspian region in connection with the building of the railway. He accomplished an important survey between Askabad and Serakhs, and returned to Askabad *viâ* Meshed, the Allah-Ekber pass, and Mahmed-abad. It was during these explorations that he noted the important fact of there being no definite rising of the land eastwards of the Caspian. He predicted that if a levelling was made from the Teke oasis to Khiva and Bukhara, there would be found places on this line where the surface will lie below the present level of the Caspian, just as such regions were found in the Sary-kamish depression, and he concluded that the Murghab and the Tejen rivers never could have discharged into the Oxus, but that they reached the Caspian sea directly, when this sea extended much further eastwards. The key to the solution of the Oxus problem was contained in this remark.

In 1882 Lessar made a second journey in order to explore the region between the Herirud and the Murghab, to the west of the route which had been followed by Shakespeare and Abbot in 1840–41. This journey upset all our previous conceptions about the mountain region which separates the valley of Herat from the land of the Turkomans. It appeared that to the west of the Murghab the Paropamiz becomes very much lower, and that the mountains rise once more to a great height only near the Herirud, under the name of Bokhut mountains. The absolute height of the Hombou pass which leads to Herat was found by Lessar not to exceed 3500 feet, and its elevation above the surrounding region was found to be only 900 feet. There would be no more obstacles for building a railway along this line than there is in the undulating regions of European Russia. From Kusan on the Herirud, Lessar visited Khorian, Meshed, and Zur-abad, thus exploring the routes in the west of Herat. In the same autumn he undertook an even more interesting journey with the view of exploring another route to the Herirud, leading through a still lower pass, the Karuan-ashan. Then, from Seraks he ventured, with five men only, to Merv; he stayed there for several days as a guest of the two khans, and, crossing the Kara-kums, reached the Amu-daria at Boyun-uzun. Next year he visited again the Kara-kums, and these two journeys laid the foundation of a scientific exploration of this extremely interesting desert.

Although all the journeys accomplished by P. M. Lessar were, so to say, mere reconnoitrings of a region which for such a long time had remained inaccessible to the Europeans in consequence of the Turkoman raids, Lessar succeeded, nevertheless, even during his rapid journeys, in enriching geographical literature with a mass of most valuable information; his training as a railway engineer, and his habit of keeping an eye upon the configuration, the altitudes, and the structure of the surface being of immense help to him in his rapid explorations. At the same time his reports were always full of extremely valuable ethnographical

observations. The unveiling of the Transcaspian deserts and oases to geography will thus always remain connected with the name of Lessar.

The reports on the journeys of Lessar were published in the *Izvestia* of the Russian Geographical Society for 1882–84. A translation of them was given in one of the parliamentary blue-books.

P. K.

CORRESPONDENCE.

Temperatures and "Glacial Reservoirs."

In his article on "Glacial Reservoirs and their Outbursts," in the May number of the *Geographical Journal*, M. Charles Rabot, on p. 545, quotes Dr. Jacob Guillarmod as having found daily maximums invariably above 32° Fahr., and seen the thermometer mount frequently to 68° Fahr., as also four times to 95° Fahr. while on the Baltoro glacier. It is not stated at what altitudes these temperatures were observed, whether on or near the comparatively low moraine-covered portions of the glacier, or at higher camps on snow and ice, nor under what conditions they were taken, nor whether they were sun or shade temperatures. We may, perhaps, infer the last, since, as my observations have shown, an ordinary thermometer would register at that season in that region from 120° to 145° Fahr. in the sun at midday, while the solar thermometer would show maxima of from 170° to over 200° Fahr.

At high snow camps it is usually difficult to find a shade suitable to taking temperatures in the middle of the day. The interior of a tent, when the sun shines, is not adapted to this purpose, as the temperature within it may be 20° or more higher than that of the air outside. As large a shade as possible should be obtained by improvising an awning of some thick material, which should project from the north side of the tent, and beneath which the largest available piece of luggage should be placed to rest the thermometers on to protect them from the radiation of cold from the ice beneath. This last precaution is also advisable in using the solar thermometer.

The maxima quoted by Dr. Guillarmod differ somewhat from those observed by me at the same season of the same year (1902), and again in 1903 on the Chogo Lungma glacier, which has practically similar weather conditions to those on the Baltoro.

During July and August at our base camp at 14,067 feet altitude, surrounded on three sides by glacial ice and snow, the highest shade maximum was 66° Fahr., noted on two occasions only, the average maximum on clear days being between 50° and 60°. Some of the comparative sun and shade maxima at this camp, taken at 1 p.m., when the sun's rays are usually hottest, were—sun 186°, shade 57°; sun 190°, shade 60; sun 192°, shade 59°; sun 195°, shade 52°. At a snow camp at 18,811 feet altitude at 1 p.m., sun 192°, shade 55°. At a snow camp on middle of glacier at altitude of 17,322 feet, sun 204°, shade 56°.

At these altitudes, where the air is much rarefied and comparatively free from moisture, the sun burns with greater power than near sea-level, where part of its heat is absorbed by the denser air before reaching the Earth's surface; but the heat brought by its rays is quickly dissipated by more rapid radiation, and cooled by contact with the great quantity of snow and ice, so that shade temperatures remain low. While the temperature of the sun's direct rays may be almost unendurable, snow and ice may remain hard frozen in deep shadow near by. Almost immediately the sun leaves a snow surface freezing begins. Shade temperature, even if considerably above 32°, counts for little as a factor in converting

ice into water on the higher parts of a glacier, as opposed to the cold contained in the ice itself. The chief agent in this process is the heat brought by the direct rays of the sun.

Even at an altitude as low as 8500 feet in the Shigar valley, far removed from any glacier, with the sun-thermometer registering 205°, the shade temperature was only 76° Fahr. It will be seen by the figures at our base camp that the highest shade maxima do not always coincide with the highest sun maxima, any more than they do at lower altitudes, varying undoubtedly under similar meteorological conditions.

In exploring the Biafo glacier in 1899, we found only one lake on it, a border lake, about 150 feet long, on the right side, three-quarters of a mile above the end of snout. At the upper part, where the Biafo broadens into Snow Lake, we encountered one of the surface sheets of water mentioned, ankle-deep, through which we waded for about 3 miles. Much more water was met with on the Biafo than on the Chogo Lungma, running in streams, some of them large, which cut deep channels into the ice, and finally plunged into caverns or crevasses, to be seen no more.

The Chogo Lungma rises more sharply than the Biafo, and to an altitude 3000 feet higher. Its upper third is much more arctic in character than the Biafo, and melting does not take place to nearly the same degree. Its surface is more broken and fissured, so that there is not the same chance for streams to form. Besides a large central surface lake surrounded by picturesque ice-cliffs, there are a number of lakes scattered over its surface and along its sides and beds of others that have been drained.

While camping on a maidan on the left bank of the glacier, we witnessed the process of emptying of a lake of the variety described as sub-glacial, one side of which was enclosed by a high lateral moraine, above which the glacier towered. The lake was fed by sub-glacial streams, the ice above it being much broken.

Late in the afternoon, when the lake became filled to the upper edge of the moraine, water began to flow over the latter in two small rivulets, which, washing out the finer particles of detritus, soon cut channels for themselves into its substance. These channels gradually increased in width and depth, until at last two good-sized sluices were discharging an ever-increasing amount of water from the reservoir behind, which about midnight became emptied, or, at least, so far reduced in volume that no more water came from it. The discharge was so well graduated that the natural streams below took care of the water without any great increase in volume.

We also had two opportunities to observe the phenomena of the shwas, in one of which (fully described in 'In the Ice World of Himalaya') we saw it burst out from near the end of the snout of a glacier, and, following the windings of a mountain torrent, pursue its devastating course downward for at least a mile, till it swept by us like a whirlwind. As our route took us down the gorge through which it passed, we were able to study its effects.

Interesting points about a shwas, as we saw it, are (1) that it comes in one compact body with irresistible force, sweeping everything movable before it, and ceases nearly as suddenly as it appears, leaving its track torn but free from noticeable deposit of mud or detritus, till its speed is checked in the levels below; (2) its extraordinary mobility. Composed of a vast mass of stones and rocks, some of them many feet in diameter and hundreds of tons in weight, held together by semi-liquid mud, it follows the windings of a torrent bed and turns corners with nearly as much facility as water.

WILLIAM HUNTER WORKMAN.

Paris, May 9, 1905.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1904-1905.

Twelfth Meeting, May 8, 1905.—Sir CLEMENTS MARKHAM, K.C.B., President, in the Chair.

ELECTIONS.—*Walter Amsden, M.R.C.S., L.R.C.P.; Colonel H. G. Proctor Beauchamp, C.B. (late 20th Hussars); Ernest Lionel Bent; Harold John Burkill, M.A.; Arthur E. Farrer; Frederick William Gill; Major Charles W. Gwynn, R.E.; Captain W. Hayes-Sadler (Royal Scots Fusiliers); Ruliff Stephen Holway; Lieut. Robert Hugh Howell (15th Lancers); Baron Erik Gustaf Evert Leijonhufvud; Adrian Lumley; Wm. Northrup McMillan; H. F. T. Maguire; J. A. Neale, D.C.L.; Lieut. T. M. Potts, R.N.R. (Comm. Egyptian Coastguard Service); Thos. Cameron Tanner.*

The Paper read was:—

"The Nile Provinces and Western Uganda." By Lieut.-Colonel Delmé-Radcliffe, M.V.O.

Thirteenth Meeting, May 15, 1905.—Sir CLEMENTS MARKHAM, K.C.B., President, in the Chair.

ELECTIONS.—*Captain W. B. T. Abbey (I.A. Asst.-Commr. Burma Commission); Oscar Henrich Anz; Arthur Henry Chanter; Harry Coleman; John Braidwood Gray; Captain A. F. Fletcher (17th Lancers); George Edw. Luckmann Gauntlett; Stanley Greville Harding; H. Herbert Holloway; Alexander Constantine Ionides; Captain Henry Raleigh Knight (East Kent Regiment); Captain L. C. Jackson, R.E.; John Tinney McCutcheon; Ian Z. Malcolm, M.P.; Archibald Rose; Charles James Cater Scott; James Herbert Smith; Charles J. Taylor; Captain Benjamin Irby Way (North Staffs. Regt.); John R. Williams.*

The Paper read was:—

"Exploration and Survey in Central Tibet and to the Sources of the Brahmaputra." By Major C. H. D. Ryder, R.E.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Col. = Colonies.
Com. = Commerce.
C. R. = Comptes Rendus.
E. = Erdkunde.
G. = Geography, Géographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
Jb. = Jahrbuch.
k. u. k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. (Mém.) = Memoirs, Mémoires.
Met. (mét.) = Meteorological, etc.
P. = Proceedings.
R. = Royal.
Rev. (Riv.) = Review, Revue, Rivista.
S. = Society, Société, Selskab.
Sc. = Science(s).
Sitzb. = Sitzungsbericht.
T. = Transactions.
Ts. = Tijdschrift, Tidskrift.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Albania. **Patsch.**

K. Akademie der Wissenschaften. Schriften der Balkankommission. Antiquarische Abteilung. III. Das Sandschak Berat in Albanien. Von C. Patsch. Wien: A. Hölder, 1904. Size 12½ × 9½, pp. 200. *Map and Illustrations. Price* 16*s.*

Although his researches were primarily concerned with archæology, the writer paid some attention to the general configuration of the country traversed, the condition of the people, and so forth. The work, therefore, is some addition to our knowledge from these points of view.

Alps. *C. Rd.* **139** (1904): 719–721. **Helbronner.**

Sur les triangulations géodésiques complémentaires des hautes régions des Alpes françaises. Note de P. Helbronner.

Alps. *C. Rd.* **139** (1904): 754–756. **Termier.**

Sur la structure générale des Alpes du Tyrol à l'ouest de la voie ferrée du Brenner. Note de P. Termier.

Alps. *C. Rd.* **139** (1904): 687–690. **Termier.**

Sur la continuité des phénomènes tectoniques entre l'Ortler et les Hohe Tauern. Note de P. Termier.

Austria. *Abh. K.K.G. Ges. Wien* **5** (1903–4) (No. 2): pp. x. and 136. **Gavazzi.**

Die Seen des Karstes. Erster Teil: Morphologisches material gesammelt von Dr. A. Gavazzi. *With Maps and Illustrations.*

Austria. *M.K.K.G. Ges. Wien* **47** (1904): 463–469. **Schaffer.**

Neue Beobachtungen zur Kenntnis der alten Flussterrassen bei Wien von Dr. F. X. Schaffer.

Austria—Bosnia and Herzegovina. **Łoziński.**

M.K.K.G. Ges. Wien **47** (1904): 538–558.

Aus der quartären Vergangenheit Bosniens und der Herzegovina. Von Dr. Walery Ritter von Łoziński. *With Plates.*

Austria—Istria. *Riv. G. Italiana* **12** (1905): 19–29. **Gravisi.**

Distribuzione della popolazione dell' Istria secondo la costituzione geologica del suolo. Studio di G. Gravisi.

Austria—Istria. *Globus* **86** (1904): 297–299. **Schneider.**

Die Entwaldung Istriens. Von K. Schneider.

Belgium and Holland. **Baedeker.**

Belgium and Holland, including the Grand-Duchy of Luxembourg. Handbook for Travellers by Karl Baedeker. 14th edition. Leipzig: K. Baedeker; London: Dulau & Co., 1905. Size 6½ × 4½, pp. lxx. and 474. *Maps and Plans. Price* 6*m. Presented by the Publishers.*

Central Europe. *Meteorolog. Z.* **21** (1904): 441–452. **Schreiber.**

Ueber die Beziehungen zwischen dem Niederschlag und der Wasserführung der Flüsse in Mitteleuropa. Von Dr. P. Schreiber.

Denmark—Stone and Bronze Ages. **Müller.**

Mém. S.R. Antiquaires Nord **1** (1903): 60–140.

Routes et lieux habités à l'age de la pierre et à l'age du bronze. Par S. Müller. Traduit par E. Philipot.

Europe—Glacial Epoch. *G.Z.* **10** (1904): 657–665. **Partsch.**

Die Eiszeit in den Gebirgen Europas zwischen dem nordischen und dem alpinen Eisgebiet. Von Prof. Dr. J. Partsch.

Cf. note in the *Journal* for November last, p. 586.

France—Picardy. **Demangeon.**

Albert Demangeon. La Picardie et les régions voisines. Artois—Cambrésis—Beauvaisis. Paris: A. Colin, 1905. Size 10 × 6½, pp. 496. *Maps and Illustrations. Price* 12 *fr. Presented by the Publisher.*

An excellent study in regional geography.

France—Vendée. **Clouzot.**

Étienne Clouzot. Les Marais de la Sèvre Niortaise et du Lay du X^e^ à la fin du XVI^e^ siècle. Paris: H. Champion, 1904. Size 10 × 6½, pp. 284. *Maps. Presented by the Publisher.*

Traces the history of the draining of the marshes to the north of the lower Sèvre Niortaise, and the various vicissitudes to which they have been subject.

Germany. *Globus* **86** (1904): 241–245. **Halbfass.**

Die Tieferlegung des Chiemsees. Ein Kapitel aus der Wirtschaftsgeographie. Von Prof. Dr. W. Halbfass. *Diagrams.*

Germany. *Globus* **86** (1904): 257–259. **Halbfass.**

Der Frickenhäuser See in Unterfranken. Von W. Halbfass. *With Map and Illustration.*

Germany. *Sitzb. K.P.A.W. Berlin*, 1904 (2): 1422–1431. **Hellmann.**

Ueber die relative Regenarmuth der deutschen Flachküsten. Von Dr. G. Hellmann. *With Maps.*

Germany—Brandenburg. **Bache.**

Die Landschaften der Provinz Brandenburg. Von Dr. Edward Bache. (Deutsches Land und Leben in Einzelschilderungen. Landschaftskunden und Stadtegeschichten. I. Landschaftskunden.) Stuttgart: Hobbing und Büchle, 1905. Size 8½ × 6, pp. viii. and 338. *Maps, Plates, etc. Price* 6*m.* 25*pf. Presented by the Publishers.*

The previous volumes of this excellent series have already been noticed in the *Journal* (vol. **23**, p. 505). The present work is arranged on a thoroughly scientific basis, the region dealt with being divided up, for description in detail, according to its physical configuration.

Russia—Ural. **Duparc and Pearce.**

Mém. S. Phys. et d'Hist. Nat. Genève **34** (1905): 383–602.

Recherches géologiques et pétrographiques sur l'Oural du Nord dans la Ratesskaya et Kizelowskaya-Datcha (Gouvernement de Perm), par L. Duparc et F. Pearce. Deuxième Mémoire. *With Map and Illustrations.*

The greater part of the memoir deals with the rocks observed, but the first two chapters give a general sketch of the topography, hydrography, and geology of the Tilaï-Kanjakovski-Serebrianski chain.

Sweden—Anthropogeography. *Ymer* **24** (1904): 281–296. **Stolpe.**

Om sambandet mellan befolknings-fördelning och geologiska bildningar i Sverige. Af P. Stolpe.

On the relation between geological structure and distribution of population in Sweden.

Switzerland. **Früh and Schröter.**

Beiträge zur Geologie der Schweiz herausgegeben von der Geologischen Kommission der Schweiz. Naturforschenden Gesellschaft, Geotechnische Serie, III. Lieferung. Die Moore der Schweiz mit berücksichtigung der gesamten Moorfrage von Prof. Dr. J. Früh und Prof. Dr. C. Schröter. Bern: A. Francke, 1904. Size 12½ × 9½, pp. xviii. and 752. *Maps and Illustrations. Presented by the Publishers.* [To be reviewed.]

Switzerland. *C. Rd.* **139** (1904): 936–938. **Delebecque.**

Sur les lacs du Grimsel et du massif du Saint-Gothard. Note de A. Delebecque.

Switzerland. *Questions Dipl. et Colon.* **18** (1904): 413–431. **Girardin.**

L'ouverture du Simplon et les intérêts français. Par Prof. P. Girardin.

Switzerland. *Vierteljahrs. Naturforsch. Ges. Zürich* **49** (1904): 40–63. **Voskule.**

Untersuchung und Vermessung des in der letzten Rückzugsperiode verlassenen Bodens des Hüfi-Gletschers. Von G. A. Voskule. *With Map and Plates.*

Switzerland.

Résultats statistiques du Recensement Fédéral du 1^er^ Décembre, 1900. Premier Volume. Berne, 1904. Size 11 × 9, pp. 48 and 370. *Maps.*

Switzerland—Jura. **Machaček.**

Petermanns M., Ergänzungsheft, Nr. **150** (1905): pp. 148.

Der Schweizer Jura. Versuch einer geomorphologischen Monographie. Von Dr. F. Machaček. *With Map, Profiles, and Illustrations.*

Switzerland—Simplon. *A travers le Monde* **10** (1904): 269–270. **Orsat.**
Autour du Simplon. Par J. Orsat. *With Maps.*

Turkey—Albania. *B.S.G. Italiana* **5** (1904): 689–703. **Barbarich.**
Saggio per una sistemazione orotettonica della regione albanese. Del tenente E. Barbarich. *With Maps.*

United Kingdom. *Symons's Meteorolog. Mag.* **39** (1904): 172–174. **Gethin-Jones.**
The Wettest Spot in the United Kingdom. By J. R. Gethin Jones.

The writer gives reasons for supposing that the maximum rainfall in the Kerry mountains is likely to exceed that of the Stye or Snowdon (cf. *Journal*, vol. **24**, p. 474).

United Kingdom—Derbyshire. **Firth.**
Highways and Byways in Derbyshire. By J. B. Firth, with Illustrations by Nelly Erichsen. London: Macmillan & Co., 1905. Size 8 × 5½, pp. xviii. and 500. *Maps and Illustrations. Price* 6*s*. *Presented by the Publishers.*

Derbyshire supplies, perhaps, as inspiring a theme for a volume of the kind as any part of the British Isles, and the author's treatment does the subject full justice. While the chief attention is avowedly directed to the literary and historical associations of the county, there are at the same time some excellent descriptions of its natural scenery, both main types of which meet with equal appreciation from the author.

United Kingdom—Wales. **Strahan and Cantrill.**
Memoirs of the Geological Survey, England and Wales. The Geology of the South Wales Coalfield. Part vi. The Country around Bridgend. Being an Account of the Region comprised in Sheets 261, 262, of the map. By A. Strahan, F.R.S., and T. C. Cantrill, B.SC. London: E. Stanford, 1904. Size 10 × 6, pp. vi. and 120. *Maps and Sections. Price* 1*s*. 6*d*.

ASIA.

Asia. **Gobineau.**
Trois ans en Asie (de 1855 à 1858). Par le Comte A. de Gobineau. Nouvelle édition. Paris: E. Leroux, 1905. Size 10 × 6½, pp. vi. and 500.

Reprint of a work published half a century ago, dealing principally with Persia, to which the author (best known for his other work, entitled 'Religions et philosophies dans l'Asie centrale') went out as French minister. There are chapters on Jiddah and Maskat, which were touched at *en route*.

Asia—History. **Cordier.**
Henri Cordier. Aperçu sur l'Histoire de l'Asie en général et de la Chine en particulier. Paris: E. Guilmoto, [not dated]. Size 9 × 6, pp. 57. *Presented by the Author.*

China. *B.S.G. Italiana* **5** (1904): 826–849. **Chiminelli.**
Pechino e la Città Proibita. Conferenza dal cav. E. Chiminelli.

China. *National G. Mag.* **15** (1904): 463–478. **Foster.**
China. By Hon. J. W. Foster. *With Maps.*

French Indo-China—Tonkin. *C. Rd.* **139** (1904): 1081–1084. ———
Prix Tchihatchef.

This award has been given to Colonel Lubanski for the excellent surveys inaugurated by him in Tongking.

Palestine—Galilee. **Schwöbel.**
Die Verkehrswege und Ansiedlungen Galiläas in ihrer Abhängigkeit von den natürlichen Bedingungen. Von Dr. V. Schwöbel. (Separatdruck aus der Z. Deut. Palästina-Vereins, Bd. xxviii.) Leipzig, 1904. Size 9 × 6, pp. 152. *Map.*
Reviewed at p. 316, *ante*.

Pamirs. *G. Tidskrift* **17** (1903–1904): 241–258. **Olufsen.**
Pamir. Alaisteppen, den afløbsløse Sø Kara Kul i det øde Ørken-Pamir og Ruten over Bjærgene mod Syd til Murgab floden. Af O. Olufsen. *Map and Illustrations.*

Persia. *Petermanns M.* **50** (1904): 227–235. **Stahl.**
Die orographischen und geologischen Verhältnisse des Karadag in Persien. Von A. F. Stahl. *With Map.*

Persia. **Malcolm.**

Five Years in a Persian Town. By N. Malcolm. London: John Murray, 1905. Size 8½ × 6, pp. xiv. and 272. *Map and Illustrations. Price* 10*s.* 6*d. net. Presented by the Publisher.*

The town referred to in the title is Yezd, in which the writer has worked as a missionary. The book deals particularly with the circumstances under which missionaries work in Persia, and is noteworthy for the care which is taken to bring out the character of the people as influenced by external physical factors.

Persian Gulf. *B.R.S.G. Madrid* **46** (1904): 164–175. **Pedro.**

Estudio sobre el Golfo Pérsico. Por Fr. Pedro de la Madre de Dios.

Philippine Islands. **Blair and Robertson.**

The Philippine Islands, 1493–1898. Edited and annotated by E. H. Blair and J. A. Robertson, with historical introduction and additional notes by E. G. Bourne. Vol. **16**, 1609 (pp. 330); vol. **17**, 1609–1616 (pp. 336); vol. **18**, 1617–1620 (pp. 346); vol. **19**, 1620–1621 (pp. 320); vol. **20**, 1621–1624 (pp. 306). Cleveland, Ohio: The Arthur H. Clark Co., 1904. Size 10 × 6½. *Plates.*

Philippine Islands. ———

Louisiana Purchase Exposition. St. Louis, 1904. Official Handbook of the Philippines and Catalogue of the Philippine Exhibit. Part i. Manila, 1903. Size 9½ × 6, pp. 450. *Illustrations.*

Russia—Caucasus. **Stevens.**

Cultivation of Tea in the Caucasus. Foreign Office, Miscellaneous No. 628, 1905. Size 9½ × 6½, pp. 6. *Price* ½*d.*

Russia—Kamchatka. **Bogdanowitsch.**

Petermanns M. **50** (1904): 59–68, 96–100, 122–125, 144–148, 170–174, 195–199, 217–221.

Geologische Skizze von Kamtschatka. Von K. Bogdanowitch. *With Maps.*

Russia—Siberia. **Bogoras.**

The Jesup North Pacific Expedition. Memoir of the American Museum of Natural History, New York. Vol. 7. The Chukchee. By W. Bogoras. I. Material Culture. Leiden: E. J. Brill, 1904. Size 14½ × 11½, pp. 276. *Maps and Illustrations. Price* 34*s. net.*

The results of this expedition are to be published in an extensive series of volumes, the completion of which will be a matter of some time.

Russia—Siberia. *Petermanns M.* **50** (1904): 222–224. **Sibiriakoff.**

Von Beresow zu Schiff zur Mündung des Tas. Von A. Sibiriakoff.

Russia—Siberia. *Iz. Imp. Russ. G.S.* **40** (1904): 31–130. **Dinin-Garkavitch.**

Sketch of the Population in the North-Tobolsk Province. By A. A. Dinin-Garkavitch. [In Russian.]

Geographical Sketch of the North-Tobolsk Province. By the same. [In Russian.] *With Map.*

Russia—Siberia. *Tour du Monde* **10** (1904): 313–372. **Stadling.**

A travers la Sibérie à la recherche d'Andrée. Par J. Stadling. Traduit et résumé par M. de Broche des Combes. *With Map and Illustrations.*

Mr. Stadling brought out an account of his journey in English in 1904 (*Journal*, vol. **17**, p. 674).

Russia—Siberia. *Smithsonian Rep.*, 1903 (1904): 611–625. **Herz.**

Frozen Mammoth in Siberia. By O. F. Herz. *Illustrations.*

Extracts translated from the report (in Russian) published in the *Bulletin* of the St. Petersburg Academy for 1902.

Russia—Siberia. **Meister.**

Explorations géologiques dans les régions aurifères de la Sibérie. Carte géologique de la région aurifère d'Iénisséi. Description de la feuille K-7, A. Meister (pp. viii. and 62); Ditto, K-8 (pp. 90); Ditto, L-6 (pp. 36); Ditto, L-8 (pp. 70); Ditto, L-9 (pp. 48). [In Russian.] St. Petersburg, 1903–1904. Size 10 × 6½.

Russian Central Asia. *Iz. Imp. Russ. G.S.* **40** (1904): 1–30. **Novitsky.**

Journey in the Peter the Great Range in the Summer of 1903. By V. F. Novitsky. [In Russian.]

Siam. **Carter.**

The Kingdom of Siam. Ministry of Agriculture, Louisiana Purchase Exposition, St. Louis, U.S.A., 1904. Siamese Section. Edited by A. Cecil Carter, M.A. New York and London: G. P. Putnam's Sons, 1904. Size 7½ × 5, pp. xii. and 280. *Illustrations.*

Turkey—Asia Minor. *Asien* **3** (1904): 148–151. **Simmersbach.**

Das Steinkohlenbecken von Heraclea in Kleinasien. Von B. Simmersbach.

Turkey—Asia Minor. *Z. Ges. Erdk. Berlin* (1904): 407–425, 498–521. **Janke.**

Die Ergebnisse einer historisch-geographischen Studienreise in Klein-Asien im Jahr 1902. Von A. Janke. *With Maps and Plates.*

Turkey—Asia Minor. *A travers le Monde* **10** (1904): 385–388. **Armagnac.**

Une Ascension au mont Olympe de Bithynie. Par J. Armagnac. *Illustrations.*

Turkey—Mesopotamia. *Asien* **4** (1904): 6–9. **Wiedemann.**

Die Kurden in Nord-Mesopotamien. Von Dr. M. Wiedemann.

Turkey—Palestine. *B. American G.S.* **36** (1904): 577–589. **Cady.**

The Historical and Physical Geography of the Dead Sea Region. By the Rev. P. Cady.

Turkey—Palestine. *Geolog. Mag.* **1** (1904): 575–582. **Bonney.**

The Kishon and Jordan Valleys. By Prof. T. G. Bonney, D.SC., etc. *With Map.*

Noticed in the Monthly Record for April (p. 454).

Turkey—Palestine. **Macalister and Masterman.**

Palestine Exploration Fund, Q. Statement (1904): 150–160; (1905): 48–61.

Occasional Papers on the Modern Inhabitants of Palestine. By R. A. S. Macalister and E. W. G. Masterman.

AFRICA.

Algeria. *C. Rd.* **140** (1905): 155–157. **Savornin.**

Esquisse orogénique des Chaînons de l'Atlas au nord-ouest du Chott el Hodna. Note de — Savornin.

Algeria—Oran. *A travers le Monde* **10** (1904): 417–420. **Myrica.**

Le Port d'Oran. Son Développement rapide et son brilliant Avenir. Par P. de Myrica. *Illustrations.*

Azores. *Archiv. Açores* **13** (1904): 53–60. **Chaves.**

Erupções submarinas nos Açorcs e a quebra de alguns dos cabos telegraphicos lançados nos mares do mesmo archipelago. F. A. Chaves.

Azores. *Archiv. Açores* **13** (1904): 61–70. **Chaves.**

Os Açores num atlas manuscrito feito em Veneza no seculo XV. F. A. Chaves. *With facsimile Maps.*

The manuscript atlas referred to is now in the Egerton collection in the British Museum (No. 73), and includes charts by various draughtsmen.

Cape Colony. **Gordon.**

Cape of Good Hope. Report by the Director of Irrigation on his Tour through the North-Western Districts. June–July, 1904. Cape Town, 1904. Size 13 × 8½, pp. 28. *Maps and Plans.*

Central Africa—Lake Kivu. *Globus* **86** (1904): 209–114, 245–249. **Kandt.**

Ein Marsch am Ostufer des Kiwu. Von Dr. R. Kandt. *Illustrations.*

Comoro Islands. *Rev. Maritime* **163** (1904): 5–18. **Gloaguen.**

Notes sur les Comores. Par — Gloaguen.

Congo State—Katanga. *Mouvement G.* **21** (1904): 553–559. ———

Au Katanga. *With Map.*

A sketch of the operations of the Katanga Company.

Egypt. **Seton-Karr.**

Fayoom Flint Implements. By H. W. Seton-Karr. Size 11 × 7½, pp. 42. *Illustrations. Presented by the Author.*

See note in the Monthly Record for April (p. 457).

Egypt. *Geolog. Mag.* **2** (1905): 58–62. **Barron.**
On the Age of the Gebel Ahmar Sands and Sandstone, the Petrified Forest, and the Associated Lavas between Cairo and Suez. By T. Barron.

Egypt—Sinai. *B.S. Khédiv. G.* **6** (1904): 243–280. **Clifton.**
Une excursion au Sinai. Par C. Clifton.

French Chad Territories. **Fourneau.**
Renseign. Colon., Comité l'Afrique Française (1904): 121–125, 145–152.
Deux années dans la région du Tchad. Par A. Fourneau. *With Map.*

French Congo. *C. Rd.* **140** (1905): 160–162. **Courtet.**
Observations géologiques recueillies par la mission Chari—Lac Tchad. Note de H. Courtet.

German East Africa. *Z. Ges. Erdk. Berlin* (1904): 627–650, 692–718. **Uhlig.**
Vom Kilimandscharo zum Meru. Vorläufige Mitteilungen über eine Forschungsreise. Von Prof. Dr. C. Uhlig. *With Map and Illustrations.*
See note in the Monthly Record for February (p. 213).

Kamerun—Climate. *Meteorolog. Z.* **21** (1904): 537–547. **Plehn, Hutter, and Hann.**
Das Klima von Kamerun. Beschreibung desselben nach Dr. Plehn, und Hauptmann Hutter. Klimatabellen von J. Hann.

Nigeria. **Lugard.**
Northern Nigeria. Report for 1903. Colonial Reports, Annual No. 437, 1904. Size 9½ × 6, pp. 42. *Diagram. Price* 4*d.*

Orange River Colony. *T. Geolog. S. South Africa* **7** (1904): 115–116. **Molengraaff.**
The Vredefort Mountain-land. By G. A. F. Molengraaff.

Portuguese East Africa. *B.S. Neuchateloise G.* **15** (1904): 5–31. **Berthoud.**
Deux problèmes hydrographiques du Pays de Gaza. Par H. Berthoud. *With Map.*

Portuguese East Africa. *B.S. Neuchateloise G.* **15** (1904): 81–83. **Grandjean.**
Quelques notes sur la zone qui s'étend entre le Bas Nkomati et la mer (Province de Lourenço Marques). Par A. Grandjean. *Map.*

Sahara. *La G., B.S.G. Paris* **10** (1904): 1–18, 85–102. **Gautier.**
Le Mouidir-Ahnet. Essai de géographie physique d'après des observations faites au cours du raid effectué par le commandant Laperrine (printemps 1903). Par E. F. Gautier. *Map.*

Sahara. *Renseign. Col. Com. Afrique Franç.* (1904): 205–213, 243–251. **Voinot.**
A travers le Mouydir. Rapport de tournée du lieutenant Voinot. Avril à Août, 1903. *Map and Illustrations.*

Sudan. *C. Rd.* **139** (1904): 1186–1190. **Lapparent.**
Sur de nouvelles trouvailles géologiques au Soudan. Note de A. de Lapparent.

Sudan. **Ward.**
Our Sudan, its Pyramids and Progress. By John Ward. London: John Murray, 1905. Size 10½ × 8, pp. xxiv. and 362. *Map and Illustrations. Price* 21*s. net. Presented by the Publisher.*
Somewhat miscellaneous jottings, in which notes on the archæology and recent history of the Nilotic Sudan are brought together without much system. There are a large number of illustrations of people, places, and incidents taken from various sources, but many are decidedly second-rate.

Transvaal. **Hatch and Corstorphine.**
The Geology of the Bezuidenhout Valley and the District East of Johannesburg. By F. H. Hatch and G. S. Corstorphine. (From *T. Geol. S. South Africa*, vol. 6, Part ii., 1904.) Size 9½ × 7½, pp. 97–109. *Sections and Illustrations. Presented by the Authors.*

Tripoli—Ghat. **Lippert.**
M. Seminars Orient. Sprachen **7** (1904) (*Afrikan. Studien*): 86–93.
Zur Eroberung der Stadt Ghat durch die Türken. Von J. Lippert.

Tripoli—Trade. **Medana.**
Il Vilayet di Tripoli di Barberia nell' anno 1902. Relazione del cav. A. Medana. (B. Ministero Affari Esteri. Nov. 1904.) Roma, 1904. Size 9 × 6½, pp. 154.

Tristan da Cunha. ———

Tristan da Cunha. Further Correspondence relating to the Island of Tristan da Cunha. (In continuation of [C. 8357] February, 1897.) London: Eyre & Spottiswoode, 1903. Size 13 × 8½, pp. iv. and 20. *Chart. Price* 4*d.*

Tristan da Cunha. *South Africa* **63** (1904): 940; **64** (1904): 41–42. ———

The Island of Tristan d'Acunha. *With Illustrations.*

Tunis—Kerkenna Islands. *La G., B.S.G. Paris* **10** (1904): 201–222. **Allemand-Martin.**

Les îles Kerkenna. Essai de Colonisation agricole. Par A. Allemand-Martin. *With Maps and Illustrations.*

Uganda. *Climate* **5** (1904): 114–119. **Cook.**

The Climate of Uganda. With a few notes upon its commoner diseases. By J. H. Cook. *With Map and Illustrations.*

Uganda. *Church Miss. Intelligencer* **55** (1904): 815–820. **Kitching and Lloyd.**

The Acholi Country. By the Rev. A. L. Kitching and A. B. Lloyd. *With Illustration.*

The Acholi are one of the less-known tribes on the upper Nile.

West Africa. **Lenfant.**

Commandant Lenfant. La grande route du Tchad. Mission de la Société de Géographie. Préface par M. Le Myre de Vilers. Introduction de Maurice Albert. Paris: Hachette et Cie., 1905 [1904]. Size 10 × 6½, pp. xvi. and 288. *Map and Illustrations. Price* 12 *fr. Presented by the Publishers.* [To be reviewed.]

West Africa. *K.A.W. Amsterdam, P. Sec. Sci.* **6** (1904): 426–440. **Sanders.**

Contributions to the determination of geographical positions on the West Coast of Africa (II.). By C. Sanders. I. Determination of the longitude of Chiloango made in the years 1901 and 1902. II. Determination of the geographical position of Mayili.

After elaborate corrections, the result arrived at for the harbour light at Chiloango is −48m. 32·1s. ±1s.

West Africa. *Deutsch. Kolonialblatt* **15** (1904): 580–581. ———

Grenzfestsetzung zwischen dem deutschen Schutzgebiet Togo und den Northern Territories der englischen Goldküsten-Kolonie vom Schnittpunkt des Dakaflusses mit dem 9. Grad nördl. Br. nordwärts bis zur Südgrenze des französischen Sudan.

West Africa—Railways. ———

West Africa. Papers relating to the Construction of Railways in Sierra Leone, Lagos, and the Gold Coast. London: Eyre & Spottiswoode, 1904. Size 13 × 8½, pp. 40. *Maps and Diagrams. Price* 2*s.*

West Africa—Rubber. ———

Reports on Rubber in the Gold Coast and Sierra Leone. Colonial Reports, Miscellaneous, No. 28, 1904. Size 10 × 6½, pp. 20. *Illustration. Price* 1½*d.*

NORTH AMERICA.

Alaska. *Abstract P. Linnean S. New York* (1903–1904): 15–39. **Figgins.**

Field Notes on the Birds and Mammals of the Cook's Inlet Region of Alaska. By J. D. Figgins. *Illustrations.*

Includes some notes on the country traversed by the writer.

Canada—Labrador. *Period. Accounts Moravian Missions* **5** (1904): 608–622. ———

Labrador. Extracts from the Station Diaries, July 1, 1903—July 1, 1904. *With Illustrations.*

Mexico. *M.K.K.G. Ges. Wien* **47** (1904): 421–462. **Schmit.**

Mein erster Ausflug in die mexikanische Tierra caliente. Erinnerungen aus dem Jahre 1865. Von Dr. E. Schmit Ritter von Tavera.

North America. **Chittenden and Richardson.**

Life, Letters, and Travels of Father Pierre-Jean de Smet, S.J., 1801–1873. Missionary Labours and Adventures among the Wild Tribes of the North American Indians, embracing minute description of their Manners, Customs, Games, Modes

of Warfare and Torture, Legends, Tradition, etc., all from Personal Observations made during many thousand miles of Travel, with Sketches of the Country from St. Louis to Puget sound and the Altrabasca. Edited from the original unpublished manuscript Journals and Letter Books and from his Printed Works, with Historical, Geographical, Ethnological, and other Notes; also a Life of Father De Smet. By H. M. Chittenden and A. T. Richardson. Four Volumes. New York: F. P. Harper, 1905. Size 10 × 6½, pp. xiv. and 1624. *Maps and Illustrations. Price 63s. net.*

United States—Black Hills. **Irving, Emmons, and Jaggar.**
U. S. Geolog. Surv., Profess. Paper, No. **26** (1904): pp. 222.

Economic Resources of the Northern Black Hills. By J. D. Irving, with contributions by S. F. Emmons and T. A. Jaggar, jun. *With Maps and Plates.*

The resources dealt with are entirely mineral. The first part gives a general sketch of the geology of the district.

United States—California. *J. Geology* **12** (1904): 579–588. **Gilbert.**

Systematic Asymetry of Crest Lines in the High Sierra of California. By G. K. Gilbert. *With Illustrations.*

United States—California. *Sierra Club B.* **5** (1905): 229–237. **Le Conte.**

The Evolution Group of Peaks. By J. N. Le Conte. *With Map and Illustrations.*

United States—Colorado. *Appalachia* **10** (1904): 392–404. **Davis.**

Glacial Erosion in the Sawatch Range, Colorado. By Prof. W. M. Davis.

Noticed in the Monthly Record for March (p. 328).

United States—Early Travels. **Thwaites.**

Early Western Travels, 1748–1846. Edited . . . by R. G. Thwaites, LL.D. Vol. vi., Brackenridge's Journal up the Missouri, 1811; Franchère's Voyage to North-west Coast, 1811–1814 (pp. 410); vol. vii., Ross's Adventures of the First Settlers on the Oregon or Columbia River, 1810–1813 (pp. 332); vol. viii., Buttrick's Voyages, 1812–1819; Evans's Pedestrious Tour, 1818 (pp. 364); Vol. ix., Flint's Letters from America, 1818–1820 (pp. 334); vol. x., Hulme's Journal, 1818–19; Flower's Letters from Lexington and the Illinois, 1819; Flower's Letters from the Illinois, 1820–21; Woods's Two Years' Residence, 1820–21 (pp. 358); vol. xi., Part i. (1819) of Faux's Memorable Days in America, 1819–20 (pp. 306); vol. xii., Part ii. (1820) of the same; Welby's Visit to North America, 1819–20. Cleveland, Ohio: The Arthur H. Clark Co., 1904–5. Size 9½ × 6½. *Maps and Plates.*

United States—Geological Survey. *National G. Mag.* **15** (1904): 365–366. ———

What the U.S. Geological Survey has done in Twenty-five years.

United States—Immigration. *Popular Sci. Monthly* **66** (1904): 166–175. **Ward.**

The Agricultural Distribution of Immigrants. By R. De C. Ward.

United States—Indiana. **Dryer.**

Studies in Indiana Geography. Edited by Prof. C. R. Dryer. First Series. Revised Edition. Terre Haute, Ind.: the Inland Publishing Co., 1905. Size 11 × 8, pp. 114. *Maps. Presented by the Author.*

An excellent series of studies in local geography, intended as a step towards supplying the need, lately emphasized by Prof. W. M. Davis, of a better knowledge, on the part of teachers, of the geography of their own country.

United States—Maryland. **Steiner.**

Descriptions of Maryland. By B. C. Steiner. (Johns Hopkins University Studies. Series xxii., Nos. 11–12.) Baltimore: 1904. Size 9½ × 6½, pp. 94.

Opens with a historical sketch, the latter, and larger, part of the work consisting of a bibliography.

United States—Meteorology. *Monthly Weather Rev.* **32** (1904): 358–363. **Hanzlik.**

The Annual and Geographical Distribution of Cyclones of high velocity (over 500 miles in twelve hours) in the United States, 1893–1902. By Dr. S. Hanzlik. *Diagrams.*

United States—Montana and Idaho. **Lindgren.**
U.S. Geolog. Survey, Profess. Paper No. 27 (1904): pp. 124.

A Geological Reconnaissance across the Bitter-root Range and Clearwater Mountains in Montana and Idaho. By W. Lindgren. *With Maps and Plates.*

United States—New York. Tarr.

Hanging Valleys in the Finger Lake Region of Central New York. By R. S. Tarr. [From the *American Geologist*, vol. 23, May, 1904, pp. 271–291.] Size 9½ × 6½. *Map and Plates. Presented by the Author.*

Noticed in the Monthly Record (February number, p. 215).

United States—Pennsylvania. *J. Geology* **12** (1904): 473–484. **Stose.**

Physiographic Studies in Southern Pennsylvania. By G. W. Stose. *With Map and Illustrations.*

United States—Survey. *B. American G.S.* **36** (1904): 676–679. ———

Work on the U.S. Topographic Atlas.

United States—Utah. *National G. Mag.* **15** (1904): 367–369. ———

Colossal Natural Bridges of Utah. *With Illustrations.*

CENTRAL AND SOUTH AMERICA.

Bolivia—Census. ———

Censo de la Población de Bolivia. Septiembre 1° de 1900. Tomo ii. La Paz, 1904. Size 14 × 9½, pp. lxxxiv., 48, and 144. *Diagrams.*

Brazil. *Export* **26** (1904): 473–475, 488–489, 501–503. ———

Die Kolonisation in Südbrasilien. (Originalbericht aus Pelotas.)

Brazil. *Globus* **86** (1904): 289–296, 309–315. **Meerwarth.**

Eine zoologische Forschungsreise nach dem Rio Acará im Staate Pará (Brasilien). Von H. Meerwarth. *With Map and Illustrations.*

Dutch Guiana. *Tijds. K. Ned. Aard. Genoots. Amsterdam* **22** (1905): 194–197. ———

Tapanahoni-expeditie.

Dutch Guiana. **Herderschee.**

Tijds. K. Ned. Aard. Genoots. Amsterdam **22** (1905): 1–174.

Verslag van de Gonini-expeditie. Door A. F. Herderschee. *With Map and Illustrations.*

French Guiana. *A travers le Monde* **11** (1905): 13–15. **Deydier.**

Montjoly. Création d'un Centre de Colonisation martiniquaise à la Guyane. Par J. Deydier. *Illustrations.*

Jamaica. **Ford and Finlay.**

The Handbook of Jamaica for 1905. Compiled by J. C. Ford and A. A. C. Finlay. London: E. Stanford, 1905. Size 8½ × 6½, pp. viii. 554, and x. *Map. Price 7s. 6d. Presented by the Publisher.*

AUSTRALASIA AND PACIFIC ISLANDS.

Fiji Islands—Folk Tales. **Fison.**

Tales from Old Fiji. By Lorimer Fison. London: A. Moring, 1904. Size 10 × 6½, pp. xlv. and 175. *Map and Plates. Price 7s. 6d. net. Presented by the Publisher.*

See review in the April number (p. 451).

New Guinea—Dutch. ———

Tijds. K. Ned. Aard. Genoots. Amsterdam **22** (1905): 189–194.

Aanteekeningen omtrent de afdeeling West-Nieuw-Guinea, ontleend aan officieele verslagen. *With Maps.*

New South Wales. *Records Geol. Surv. New South Wales* **7** (1904): 281–300. **Andrews.**

The Geology of the New England Plateau, with special reference to the Granites of Northern New England. Part i. Physiography. By E. C. Andrews. *With Plates.*

Pacific Ocean. *National G. Mag.* **15** (1904): 478–489. **Hague.**

A Doubtful Island of the Pacific. By J. D. Hague. *With Maps and Illustration.*

Noticed in the Monthly Record for March (p. 331).

POLAR REGIONS.

Antarctic. **Davis.**

A Letter from the Antarctic. By Captain J. E. Davis. London: W. Clowes &

Sons, 1901. Size 8½ × 5½, pp. 38. *Portrait and Illustrations. Presented by P. L. H. Davies, Esq.*

The writer was second master of the *Erebus* in Sir James Ross's expedition, and this letter, dated April 11, 1842, gives a vivid description of the voyage.

Antarctic. *Riv. G. Italiana* **12** (1905): 44–45. **Musoni.**

"Terra di Ross" o "Terra di Re Edoardo VII.?" F. Musoni.

Urges priority for the name Rossland.

Antarctic—Scottish Expedition. *Scottish G. Mag.* **21** (1905): 24–37. **Pirie and Brown.**

The Scottish National Antarctic Expedition. Second Antarctic Voyage of the *Scotia*. By J. H. Harvey Pirie and R. N. Rudmose Brown. *With Map, Portrait, and Illustrations.*

MATHEMATICAL GEOGRAPHY.

Cartography—Methods. *M.K.K.G. Ges. Wien* **47** (1904): 280–325, 365–420. **Peucker.**

Neue Beiträge zur Systematik der Geotechnologie. Ein Rundblick über die Reliefs und Wandkarten der Wiener Ausstellung neuerer Lehr- und Anschauungsmittel (1903). Von Dr. K. Peucker.

Compass. *Riv. G. Italiana* **11** (1904): 433–452. **Bertelli.**

Sopra un nuovo supposto primo inventore della bussola nautica. Memoria del Padre T. Bertelli.

Cf. note in Monthly Record for March (p. 334).

Geodesy. *Science* **21** (1905): 46–50. **Tittmann.**

The Present State of Geodesy. By O. H. Tittmann.

Geophysics. *C. Rd.* **140** (1905): 192–198. **Lœwy and Puiseux.**

Étude des photographies lunaires. Considérations sur la marche de la solidification dans l'intérieur d'une planète. Note de MM. Lœwy et Puiseux.

The authors' observations have an important bearing on the past history of the globe.

Nautical Almanac.

The Nautical Almanac and Astronomical Ephemeris for the year 1908. Edinburgh, [1905]. Size 9½ × 6, pp. xiv., 602, and 42. *Diagrams. Price* 2*s.* 6*d.* (Also part i. separately. *Price* 1*s.*)

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Geology. **Branner.**

Syllabus of a Course of Lectures on Elementary Geology. By J. C. Branner, PH.D. Second Edition. Stanford University, 1902. Size 9½ × 6, pp. 370. *Illustrations. Presented by the Author.*

Geology. *C. Rd.* **139** (1904): 714–716. **Suess.**

Sur la nature des charriages. Note de E. Suess.

Geomorphology. **Costa.**

Ensaios de Paleogeographia. Evolução geographica das fórmas actuaes. Por A. A. d'Oliveira Machado e Costa. Lisboa, 1904. Size 10½ × 6½, pp. 152. *Maps. Presented by the Author.*

Glacial Erosion. *J. Geology* **12** (1904): 569–578. **Johnson.**

The Profile of Maturity in Alpine Glacial Erosion. By W. D. Johnson.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Anthropogeography. **Kirchhoff.**

Mensch und Erde. Skizzen von den Wechselbeziehungen zwischen beiden. Von Alfred Kirchhoff. Zweite Auflage. Leipzig: B. G. Teubner, 1905. Size 7½ × 5, pp. 128. *Price* 1*m. Presented by the Author.*

A series of striking sketches illustrating the mutual relations between man and his environment. The first edition appeared in 1901.

Anthropology. *Riv. G. Italiana* **11** (1904): 462–472. **Biasutti.**

Problemi vecchi e idee nuove: la classificazione delle razze umane. R. Biasutti.

Historical. **Detlefsen.**

Die geographischen Bücher (II. 242—VI. Schluss) der Naturalis Historia des

C. Plinius Secundus mit vollständigem kritischen Apparat herausgegeben von D. Detlefsen. (Quellen und Forschungen zur alten Geschichte und Geographie. Herausgegeben von W. Sieglin. Heft 9.) Berlin: Weidmannsche Buchhandlung, 1904. Size 10½ × 6½, pp. xviii. and 282.

BIOGRAPHY.

Ballivián. *B.S.G. La Paz* **5** (1904): 212–222. **Pinilla.**

Señor Manuel Vicente Ballivián. Por C. F. Pinilla.

Blanford. *Geolog. Mag.* **2** (1905): 1–15. ———

Eminent Living Geologists: W. T. Blanford, C.I.E., etc. *With Portrait.*

GENERAL.

Geography. **Lespagnol.**

G. Lespagnol. L'Évolution de la Terre et de l'Homme. Paris: C. Delagrave, [*not dated*]. Size 8 × 5½, pp. vi. and 720. *Maps and Illustrations. Price 5 fr. Presented by the Publisher.*

A comprehensive outline of the whole field of geography, keeping in view the modern conception of the subject as a synthetic science. The numerous illustrations are well chosen.

World. **Moncrieff.**

The World of To-day. A Survey of the Lands and Peoples of the Globe as seen in Travel and Commerce. By A. R. Hope Moncrieff. Vol. i. London: The Gresham Publishing Co., 1905. Size 11 × 7½, pp. viii. and 280. *Maps and Illustrations. Price 8s. net. Presented by the Publishers.*

A popular description of the countries of the world, to be completed in six volumes. The author seems to have a good general grasp of his subject, and to be acquainted with the main results of modern travel, though betraying ignorance on some points. Thus Nordenskiöld's voyage in the *Vega* is said to have taken place in 1818, and that this is not a mere typographical error (of which other instances certainly occur on the same page) seems shown by its being apparently placed, in point of time, before the discovery of the north-west passage. On the whole, the author seems to have a certain power of bringing out the salient features of the countries described

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NEW MAPS.

By E. A. REEVES, *Map Curator*, R.G.S.

EUROPE.

Austria. **Military Geographical Institute, Vienna.**

Strassen-Karte des Erzherzogthumes Österreich unter der Enns. Scale 1 : 75,000 or 1·8 stat. mile to an inch. 13 sheets. Vienna: K. u. k. militär-geographisches Institut.

The basis of this map is the large 1 : 75,000 Government survey of Austria-Hungary. Upon this the roads are shown in different colours and symbols, according to their class and importance. Distances between places, in kilometres, are given in figures along the roads. Railways and tramways are shown in black.

Elbe. **Müllenhoff.**

Küstenänderungen in Süderithmarschen im 19. Jahrhundert. Von L. Müllenhoff. *Petermanns Geographische Mitteilungen*, Jahrgang 1905, Tafel 7. Gotha: Justus Perthes, 1905. *Presented by the Publisher.*

England and Wales. **Ordnance Survey.**

Ordnance Survey of England and Wales:—Sheets published by the Director-General of the Ordnance Survey, Southampton, from April 1 to 29, 1905.

1 inch:—

(Third edition), in outline, 14, 240, 252, 287, 303, 319, 334. 1*s. each* (engraved).

6-inch—County Maps (first revision):—

Brecknockshire, 11 N.E., 17 S.E., 18 S.W., 24 N.W., S.W. **Herefordshire**, 16 S.E., 23 N.E., 24 N.W., S.W., 28 S.W., S.E., 30 S.E., 31 S.W., 33 N.E., 35 S.W., 37 N.W., S.W., 45 S.E. **Lincolnshire**, 143 S.W. **Radnorshire**, 24 S.E., 29 S.E., 31 N.E., 33 N.E., 36 S.E. **Suffolk**, 45 S.E., 46 N.E., 54 S.E., 58 N.E., 59 N.W., N.E., S.W., 60 S.W., 61 N.E., 68 N.E., 72 N.W., N.E., 76 N.E., 79 N.E., S.E., 87 N.W. **Worcestershire**, 28 N.E., 40 N.E. 1*s. each.*

25-inch—County Maps (first revision):—

Cardiganshire, IX. 16; X. 13, 14, 15, 16; XI. 7, 9, 14, 15, 16; XII. 13; XIV. (3 and 7), 4, (7 and 3), 8, 11, 12; XV. 1, 2, 3, 6, 7, 8, 9, 10, 11, 12. **Devonshire,** XVI. 10; XXVIII. 13, 14, 15, 16; XXXI. 13, 14; XXXII. 13, 14, 15, 16; LV. 1, 5, 9; LXXIX. 10, 12, 14; XCI. 2, 3, 10, 11. **Lincolnshire,** XCIV. 16; XCV. 6, 7, 8, 11, 12, 15; CIII. 3, 7; CVI. 6; CVII. 1, 2, 3, 4, 5, 6, 7, 8, 11, 12, 13, 15, 16. **Norfolk,** XCI. 15; XCIV. 5, 11, 13; XCV. 6, 8; XCVI. 9; XCVII. 1; XCVIII. 11; XCIX. 9; CIII. 1; CIV. 1, 2, 3, 4; CV. 1, 2, 3, 4, 5, 6, 7, 8, 11, 12, 15, 16. **Suffolk,** V. 15; VIII. 11; IX. 9; XI. 4, 8, 10. **Warwickshire,** XXII. 1, 6, 10, 14, 16; XXIII. 13, 14; XXIV. 15; XXVI. 4, 8, 12; XXVII. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12; XXVIII. 2, 3, 6, 10; XXXI. 3, 9; XLIII. 5, 6, 7. *3s. each.*

(*E. Stanford, London Agent.*)

England and Wales. **Geological Survey.**

6-inch maps. Uncoloured.

Glamorgan, 26 N.E., 33 N.E., S.W., S.E. *Price* 1*s.* 6*d. each.*

(*E. Stanford, London Agent.*)

France. **Ministre de l'Intérieur, Paris.**

Carte de la France dressée par ordre du Ministre de l'Interieur. Scale 1 : 100,000 or 1·6 stat. mile to an inch. Sheets (new editions): VI.-17, Pluvigner; VIII.-20, Pornic; X.-23, Fontenay-le-Comte; X.-25, Rochefort; X.-33, Tartas; XI.-23, Niort; XI.-27, Jonzac; XII.-12, Lisieux; XIII.-19, Tours; XIV.-14, Verneuil; XVI.-5, Calais; XVII.-14, Melun; XVIII.-6, Lille; XVIII.-10, Chauny; XVIII.-17, Chateaurenard; XVIII.-25, Clermont-Ferrand; XX.-7, Maubeuge; XX.-23, Charolles; XXI.-26, Lyon (Sud-Ouest); XXI.-29, Lavoulte; XXII.-24, Bourg; XXII.-25, Lyon (Nord-Est); XXII.-35, Martigues: XXIII.-28, Grenoble; XXIV.-27, Allevard; XXV.-20, Morteau; XXV.-22, Les Echampés; XXV.-28, Modane; XXVI.-27, Lanslebourg. Paris: Ministère de l'Interieur, Service Vicinal, 1904. *Price* 0.80 *fr. each sheet.*

Mersey River. **Belam and Ashton.**

Chart of the River Mersey, from Rock Lighthouse to Eastham and Garston. Scale 1 : 18,000 or 3·52 inches to a mile. Henry Belam, Commander, M.V.O., R.N., Marine Surveyor; H. G. G. Ashton, F.R.G.S., Assistant Marine Surveyor, Mersey Docks and Harbour Board. Liverpool, 1905. *Presented by H. G. G. Ashton, Esq.*

The present edition of this chart has received corrections up to April, 1905.

Norway. **Norges Geografiske Opmaaling.**

Topografisk Kart over Kongeriget Norge. Scale 1 : 100,000 or 1·6 stat. miles to an inch. Sheets: 1-U, Ingö; 1-Y, Nornkyn; 2-Æ, Makur; 2-U, Rolfeö; 2-Y, Hopseidet; 2-Z, Berlevaag; 4-T, Öksfjord; 4-U, Komagfjord; 5-D, Arendal; 5-U, Alten; 9-K, Hadsel; 9-N, Narvik; 11-I, Lofotodden; 12-J, Helligvær; 13-J, Gildeskaal; 14-I, Valvær; 15-H, Trænen; 15-I, Lurö; 32-C, Ytre Rendalen; 38-B, Söndre Fæmund. 1903–4. *Price Kr.* 0.60 *each sheet.*—Geologisk Kart over Kongeriget Norge. Scale 1 : 100,000 or 1·6 stat. mile to an inch. Sheet: 23-A, Voss. 1905.—Karte over Söndre Trondhjem. Amt III. Scale 1 : 200,000 or 3·1 stat. miles to an inch. 1904. *Price Kr.* 1.00. Christiania: Norges Geografiske Opmaaling, 1904. *Presented by the Institute Géographique de Norvège.*

Switzerland. **Swiss Topographical Survey.**

Topographischer Atlas der Schweiz (Siegfried-Atlas). Scale 1 : 25,000 or 2·5 inches to a stat. mile. Sheets (new editions): 41, Bülach; 45, Kloten; 55, Ellikon; 238, Schwende.—Scale 1 : 50,000 or 1·3 inch to a stat. mile. Sheet (new edition) 382, Isenthal. Bern: Schweiz. Landestopographie, 1904. *Price* 1.0 *fr. each sheet.*

ASIA.

Asia. **Service Géographique de l'Armée, Paris.**

Carte de l'Asie. Scale 1 : 1,000,000 or 15·8 stat. miles to an inch. Sheets: Asterabad, Merv, Boukhara, Hérat, Maimènè. Paris: Service Géographique de l'Armée, 1904–5. *Price* 1.25 *fr. each sheet.*

Hitherto the sheets of the 1 : 1,000,000 map of Asia published by the Service Geographique de l'Armée have been confined to China, Manchuria, and the Far East: but those now issued include important regions of the south-western part of the continent in the neighbourhood of the Russian, Persian, and Afghan boundaries. They are clearly drawn, and printed in colours.

Manchuria. **Japan Times.**

The *Japan Times* War Map No. 3. Seat of Battle of Mukden. Scale 1 : 400,000 or 6·3 stat. miles to an inch. Supplement to the *Japan Times*, March 16, 1905. Tokyo. *Presented by Captain J. M. James.*

AFRICA.

Africa. **Service Géographique de l'Armée, Paris.**

Carte de l'Afrique, dressée et exécutée au Service géographique par M. le Commandant de Lannoy de Bissy, de 1882 à 1890, continuée et revisée par M. le Capitaine Rouby. Sheets (new editions): 4, Fez; 16, St. Louis. Paris: Service Géographique de l'Armée, 1904–5. *Price* 1.0 *fr. each sheet.*

A remarkable improvement has taken place in the style of production of this map since the first edition was published. The sheets are now clearly printed in colours instead of being in black only, and much new information has been added. It was, doubtless, a mistake to adopt the orthographic projection for the map, and on no sheets of the map is this more apparent than on the present. Owing to their occupying an outlying position on the western limit of the map, the defects of the projection are most conspicuous.

Africa. **Topographical Section, General Staff.**

Map of Africa. Compiled in the Topographical Section, General Staff, War Office. Scale 1 : 250,000 or 3·9 stat. miles to an inch. Sheets: Lagos, 73-B, 73-F; Southern Nigeria, 74-I, 74-M. London: Topographical Section, General Staff, War Office, 1905. *Price* 1*s.* 6*d. each sheet. Presented by the Director of Military Operations.*

AMERICA.

Canada. **Department of the Interior, Ottawa.**

Standard Topographical Map of Canada. Scale 1 : 250,000 or 3·9 stat. miles to an inch. Sheet 1-S.E., Ontario, London Sheet. Ottawa: Department of the Interior, 1905. *Presented by James White, Esq., Geographer, Department of the Interior, Ottawa.*

At the Geographical Congress held in London in 1895 it was decided to adopt the 1 : 1,000,000 natural scale as a standard, and, as far as possible, to construct all future important maps on some even multiple of this scale—such as 1 : 500,000, 1 : 250,000, etc. During the period that has elapsed since that date considerable progress has been made with this scheme, although the ideal 1 : 1,000,000 map of the whole world then suggested is, of course, a thing of the distant future. It is gratifying to see that Canada has now fallen in line with the proposal, and has commenced a general topographical map on the scale of 1 : 250,000—a map which, from the two sheets already received, the first of which was mentioned in this *Journal* in October last, promises to be a really useful and well-executed map. Each sheet is to comprise a degree of latitude and a degree and a half of longitude, and the present one extends from 42° N. to 43° N., and from 80° W. to 81° 30′ W., and includes a part of the northern shores of L. Ontario, and the towns of London, Stratford, Brantford, and Galt.

Canada. **Dept. of the Interior, Ottawa.**

Relief Map of the Dominion of Canada. Scale 1 : 6,336,000 or 100 stat. miles to an inch. Ottawa: Department of the Interior, 1904. *Presented by James White, Esq., Geographer, Department of the Interior, Ottawa.*

This is a very creditable attempt at an orographically coloured map of the Dominion of Canada, although at the present time the data for the completion of such a map must be extremely approximate in many districts, especially in the far north. Elevations below 100 feet are left uncoloured, and higher than this the land between 100 feet and over 10,000 feet is shown in six tints of burnt sienna and brown, which have been selected with care, and give a satisfactory and graphic impression of the general relief of the country.

Canada, Northern. **Dept. of the Interior, Ottawa.**

Explorations in Northern Canada and adjacent portions of Greenland and Alaska. Ottawa: Department of the Interior, 1904. *Presented by James White, Esq., Geographer, Department of the Interior, Ottawa.*

This is a most interesting exploration chart of the Arctic Regions of America, showing the routes and dates of the principal expeditions from the earliest times, with the coast-line explored by each in different colours, a full explanation of which is

given. There are one or two slight errors in names, such as "Axel Heiperg" island for Axel Heiberg island, "Ommaney" for Ommanney, the name of the late well-known admiral of that name of Arctic fame; but these are trifling matters, after all, and the chart will be most useful for reference in connection with the history of discovery in these regions.

AUSTRALASIA.

Tasmania. **Surveyor-General, Tasmania.**

Tasmania. Scale 1 : 950,400 or 15 stat. miles to an inch. Hobart: Surveyor-General's Office, 1904. *Presented by the Agent-General for Tasmania.*

Western Australia. **Dept. of Lands and Surveys.**

Map of Western Australia. Scale 1 : 4,742,000 or 75 stat. miles to an inch. Perth: Department of Lands and Surveys, 1903. *Presented by the Agent-General for Western Australia.*

POLAR REGIONS.

Greenland. **Engell.**

Die Verbreitung der rezenten Meeresablagerungen an den Küsten der Disko-Bai, West Grönland. Von M. C. Engell. Scale 1 : 500,000 or 7·9 stat. miles to an inch. *Petermanns Geographische Mitteilungen*, Jahrgang 1905, Tafel 8. Gotha: Justus Perthes, 1905. *Presented by the Publisher.*

GENERAL.

World. **Johnston.**

The Royal Atlas of Modern Geography. By the late Alexander Keith Johnston, with additions and corrections to present date by G. H. Johnston. Revised sheets: Frontispiece, North Polar Chart; No. 10, France; 11, Spain and Portugal; 16, Belgium and the Netherlands; 17, Denmark; 18, Empire of Germany; 22, Turkey in Europe; 23, Greece; 24, Sweden and Norway; 25, Basin of the Baltic Sea; 29, Central Asia; 31, Palestine; 33 and 34, India; 37, Australia; 40, Africa; 46, North America; 47, Central Canada; 55 and 56, South America. Edinburgh and London: W. & A. K. Johnston, 1905. *Presented by the Publisher.*

Since the notice of the 1905 edition of the Royal Atlas was published in the last number of the *Geographical Journal*, Messrs. W. & A. K. Johnston have forwarded the above revised sheets of the atlas, upon which many of the errors pointed out have been corrected. It is a pity that these sheets were not included in the atlas instead of those so much behind the times.

World. **Petrie and Schokalsky.**

Marck's Large General Table Atlas. Edited by Prof. E. J. Petrie and Colonel J. de Schokalsky. Parts 11 and 12. St. Petersburg: A. F. Marcks, 1905. *Presented by the Publisher.*

These are the concluding parts of this atlas, and contain, besides the title-page and a complete index, the following maps: No. 14, general map of European Russia, on the scale of 1 : 8,250,000; No. 29, European Russia, on the scale of 1 : 2,000,000, sheet 15 bis; Nos. 46 and 47, Siberia, on the scale of 1 : 10,000,000; No. 57, North America, on the scale of 1 : 20,000,000; No. 58, United States, on the scale of 1 : 10,000,000; No. 60, South America, on the scale of 1 : 16,000,000.

The atlas, the first parts of which were noticed in the *Geographical Journal* for February, 1904, has quite answered to expectations, and the style in which it has been produced reflects credit on all concerned.

World. **Stieler.**

Neue, neunte Lieferungs-Ausgabe von Stielers Hand-Atlas. 100 Karten in Kupferstich, herausgegeben von Justus Perthes' Geographischer Anstalt in Gotha, 45 und 46 Lieferung. These parts contain the following maps: No. 1, The Northern Constellations, by Dr. C. Rohrbach; No. 2, The Southern Constellations, by Dr. C. Rohrbach; Nos. 96 and 98, South America, on the scale of 1 : 7,500,000, by H. Habenicht, sheets 2 and 4. Gotha: Justus Perthes, 1905. *Price 60 pfg. each part.*

The star maps are entirely new productions. In addition to the names of the constellations, Dr. Rohrbach has, for the zodiac, unnecessarily confused his maps with large outline drawings of figures which, on recent maps, have been very properly dispensed with. The system adopted for representing the different magnitudes of the stars is also remarkable, for whilst a 5th magnitude is shown by an extremely small spot about the size of a pinhole, the larger stars are shown as large black discs,

Sirius being nearly as large as a threepenny-piece. This, on a map of the heavens which measures only 13½ × 16 inches, is decidedly misleading, and renders it almost impossible to recognize the general configuration of any constellation or group as a whole.

New stars, nebulæ, variables, and double stars are all distinguished by different symbols, either in black or red, and several telescopic stars are shown in the latter colour.

CHARTS.

Danish Chart. **Danish Admiralty.**

No. 208, Færöerne. Scale 1 : 100,000 or 1·6 stat. mile to an inch. 2 sheets. Copenhagen: Danish Admiralty, 1905. *Presented by the Danish Admiralty.*

Elbe River. **Bureau f. Strom-u. Hafenbau, Hamburg.**

Stromkarte der Norder-Elbe. Scales 1 : 6000 and 1 : 3000 or 10·6 inches and 21·1 inches to 1 stat. mile. Sheets 5, 6, 7, 7A, 10. Hamburg: Bureau für Strom- und Hafenbau, 1904.

North Atlantic. **U.S. Hydrographic Office.**

Pilot Chart of the North Atlantic Ocean for May, 1905. Washington: U.S. Hydrographic Office, 1905. *Presented by the U.S. Hydrographic Office.*

North Atlantic and Mediterranean. **Meteorological Office.**

Pilot Chart of the North Atlantic and Mediterranean for May, 1905. London: Meteorological Office, 1905. *Price 6d. Presented by the Meteorological Office.*

North Pacific. **U.S. Hydrographic Office.**

Pilot Chart of the North Pacific Ocean for May, 1905. Washington: U.S. Hydrographic Office, 1905. *Presented by the U.S. Hydrographic Office.*

Norway. **Norges Geografiske Opmaaling.**

Norwegian Hydrographic Charts, Nos.: A 4, Den Norske Kyst fra Leka og Sklinden til Vestfjorden, scale 1 : 350,000, 2 sheets, 1904; A 131, Specialkart over Nordfjord, scale 1 : 100,000, 1903, *price kr.* 1·60; B 441, Specialkart over den Norske Kyst fra Gjæslingerne til Nordöerne og Kalvö, scale 1 : 50,000, 1904, *price kr.* 1.00; B 48, Den Norske Kyst fra Tjötta til Dönna, scale 1 : 50,000, 1905, *price kr.* 1.00. Specialkarter over Havne i Finmarken, Blad iii., iv., v., 1903–04, *price* 1.00 *kr. each sheet.* Christiania: Norges Geografiske Opmaaling. *Presented by the Institute Géographique de Norvège.*

PHOTOGRAPHS.

Colorado. **Jackson.**

Twelve photographs of Colorado, taken by W. H. Jackson. *Presented by Sir Joseph Hooker, G.C.S.I., C.B., F.R.S.*

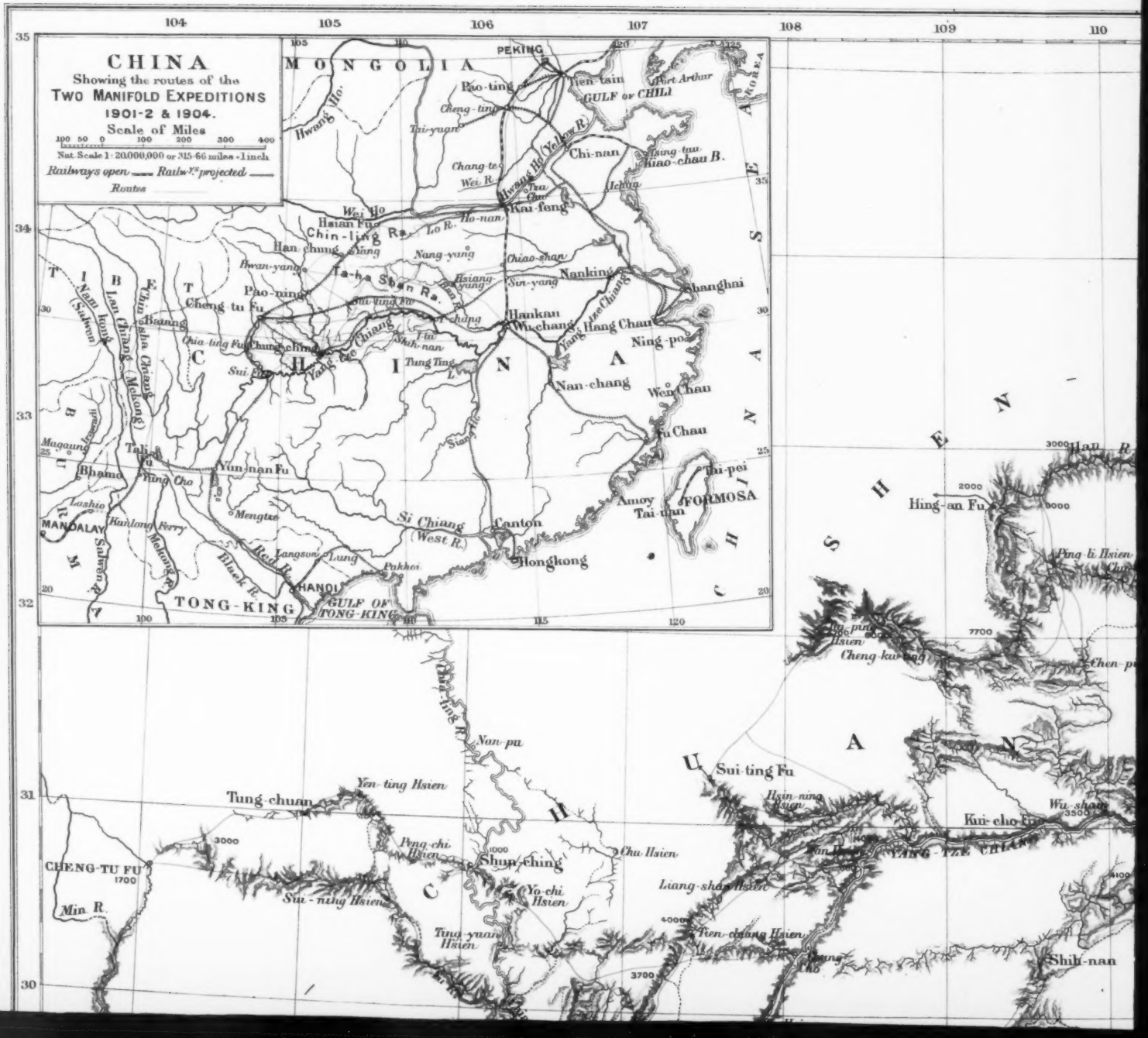
This is an excellent series of large photographs measuring 17 × 22 inches, taken by Jackson of Denver, Colorado, about thirty years ago. They are printed direct from the negatives, and are not enlargements. They are splendid representatives of the grand mountain scenery of this part of Western America.

(1) Georgetown; (2) Uncompagre mount; (3) Great Morainal valley on the Arkansas at mouth of La Plata; (4) Lake San Miguel; (5) Mount Harvard; (6) View on Lake Fork, looking up Snare creek; (7) View near the head of the Lake Fork of Gunnison river; (8) The Upper Twin lake; (9) Baker's park and Sultan mount; (10) Lake San Cristoval; (11) Grey's peak from Argentine pass; (12) The Highland Mary Mining Works, Baker's park.

Vegetation Types. **Karsten and Schenck.**

Vegetationsbilder, herausgegeben von Dr. G. Karsten und Dr. H. Schenck. Dritte Reihe, Heft 1. Blumengärten der Ameisen am Amazonenstrome. Von E. Ule. Jena: G. Fischer, 1905.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.


CHINA
Showing the routes of the
TWO MANIFOLD EXPEDITIONS
1901-2 & 1904.
Scale of Miles
100 50 0 100 200 300 400
Nat. Scale 1: 20,000,000 or 315·66 miles = 1 inch
Railways open
Railw.ys projected
Routes
MONGOLIA
PEKING
Pao-ting
Tien-tsin
Port Arthur
GULF or CHILI
Cheng-ting
Tai-yuan
Hwang Ho
Chang-te
Wei R.
Hwang Ho (Yellow R.)
Chi-nan
Kiao-chau B.
Ichwa
Kai-feng
Wei Ho
Hsian Fu
Chin-ling Ra.
Lo R.
Ho-nan
Han chung
Nang-yang
Hwan-yang
Chiao-shan
Nanking
Shanghai
Pao-ning
Cheng tu Fu
Ta-ho Shan Ra.
Hsiang-yang
Sui-yang
Yang tze Chiang
Hankau
Wu-chang
Hang Chau
Ning-po
Chia-ting Fu
Chung-king
Shih-nan
Tung Ting L.
Nan-chang
Wen Chau
Fu Chau
Tu-pei
Amoy
FORMOSA
Tai-nan
Yun-nan Fu
Ping Cho
Mengtze
Si Chiang (West R.)
Canton
Hongkong
Lashio
MANDALAY
Kardong Ferry
Salween R.
Mekong R.
Langson
Lung Pakhoi
Red R.
Black R.
HANOI
TONG-KING
GULF OF TONG-KING
Nan-pu
Sui-ting Fu
Yen-ting Hsien
Tung-chuan
Peng-chi Hsien
Shun-ching
Cha Hsien
CHENG-TU FU
Min R.
Su-ning Hsien
Yo-chi Hsien
Liang-shan Hsien
Tien-chang Hsien
Tung-yuan Hsien
Shih-nan
Hing-an Fu
Ping-li Hsien
Cheng-ku-ching
Kui-cho Fu
Wu-shan
YANG-TZE CHIANG
HUNAN
HUPEH
SHENSI
KIANGSU
KIANGSI
KWEICHOW
YUNNAN
KWANGSI
KWANGTUNG
TIBET
Lan Chiang (Mekong)
Chin sha Chiang
Nam kong (Salween)
Irrawadi R.
Bhamo
Magaung
Taling
Baang
104
105
106
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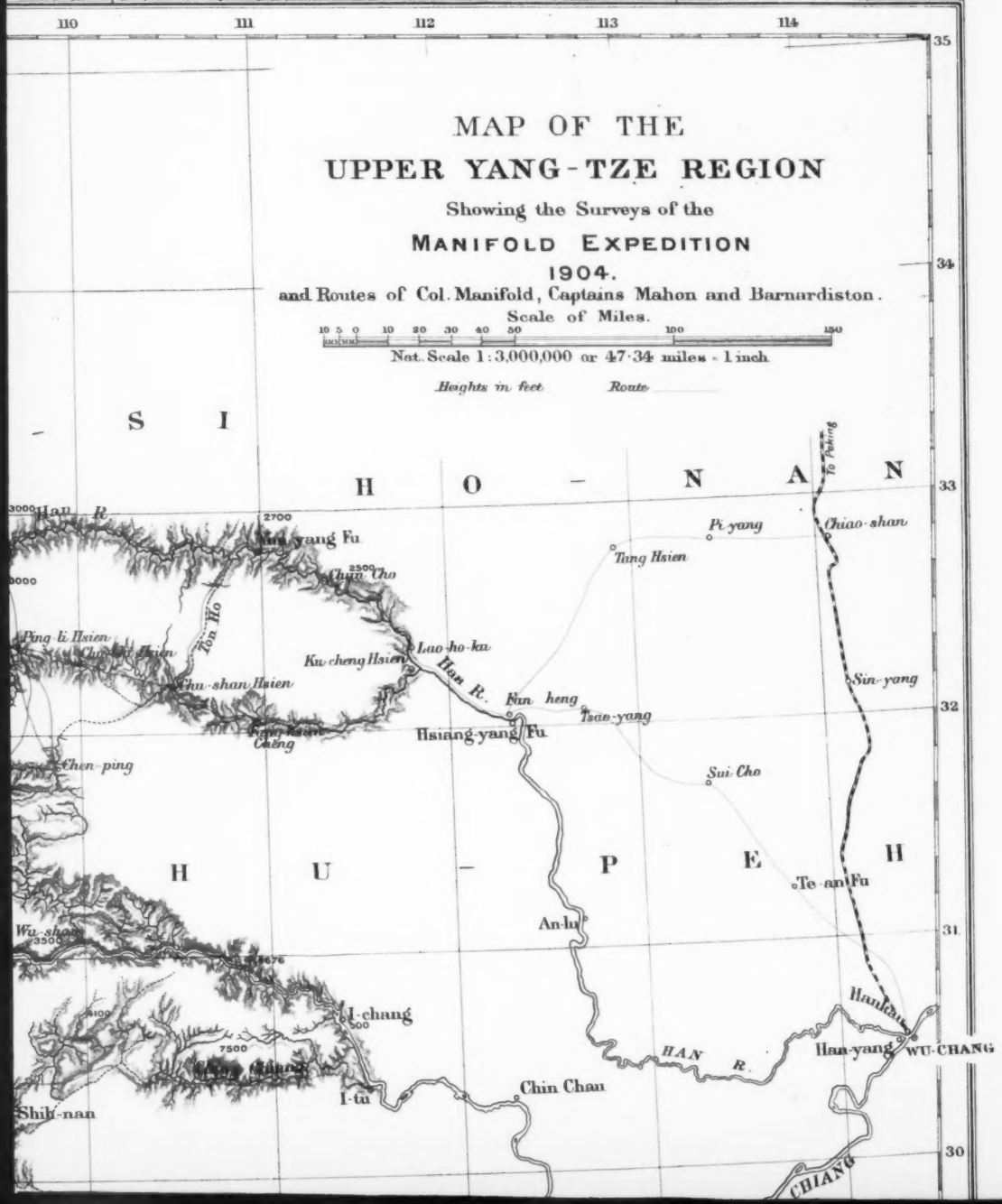
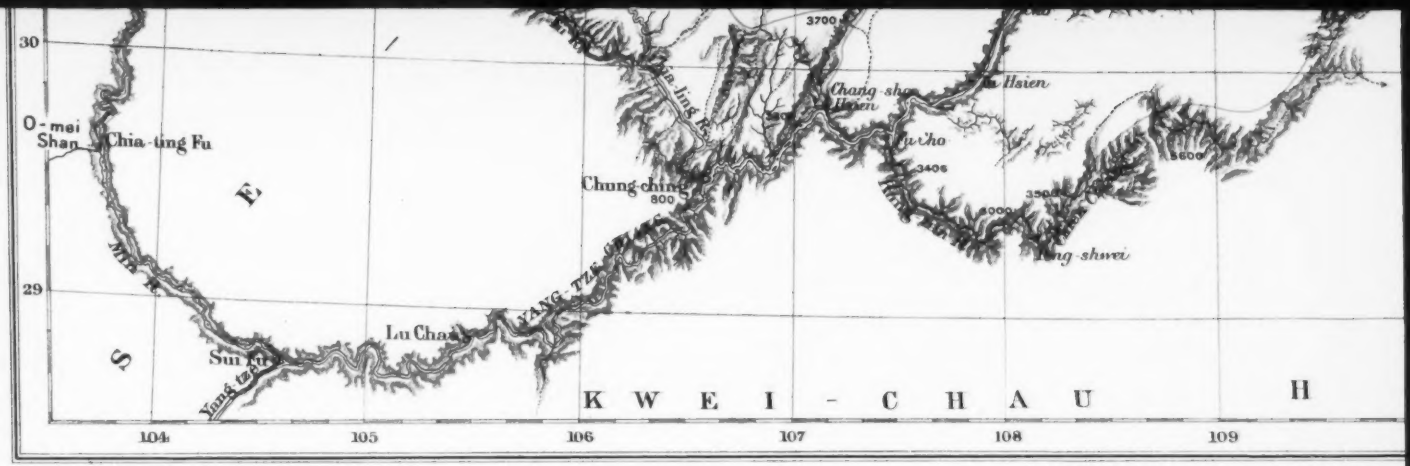
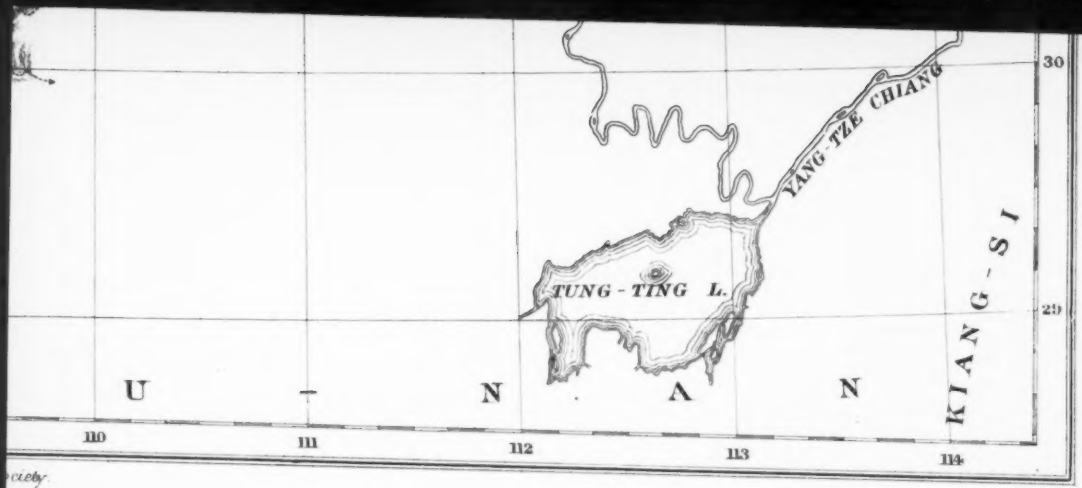

110
111
112
113
114
35
34
33
32
31
30
MAP OF THE
UPPER YANG-TZE REGION
Showing the Surveys of the
MANIFOLD EXPEDITION
1904.
and Routes of Col. Manifold, Captains Mahon and Barnardiston.
Scale of Miles.
10 5 0 10 20 30 40 50 100 150
Nat. Scale 1:3,000,000 or 47·34 miles = 1 inch.
Heights in feet
Route
S I
H O – N A N
H U – P E H
To Peking
Han R.
Hsiang-yang Fu
Tung Hsien
Pi-yang
Chiao-shan
Sin-yang
Fan heng
Tsao-yang
Sui Cho
Te-an Fu
An-lu
Ton Ho
Ping-li Hsien
Chu-shan Hsien
Ku-cheng Hsien
Lao-ho-kou
Chen-ping
Wu-shen
I-chang
I-tu
Shih-nan
Chin Chan
Hankau
Han-yang
WU-CHANG
HAN R.
CHIANG



Secant Conical Projection

Published by the Royal Geographical Society


YANG-TZE CHIANG
TUNG-TING L.
U N A N
KIANG-SI
30
29
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112
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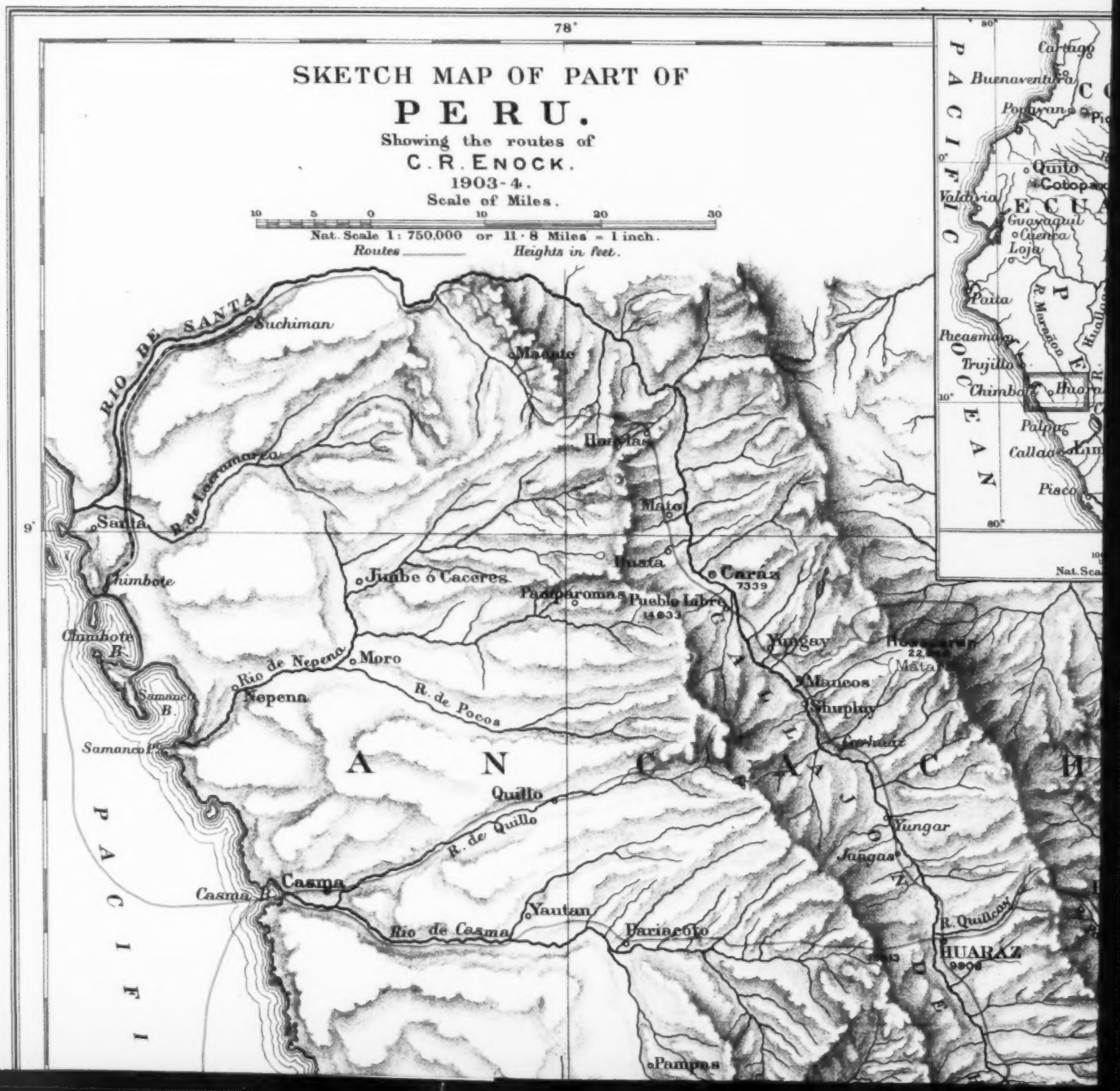
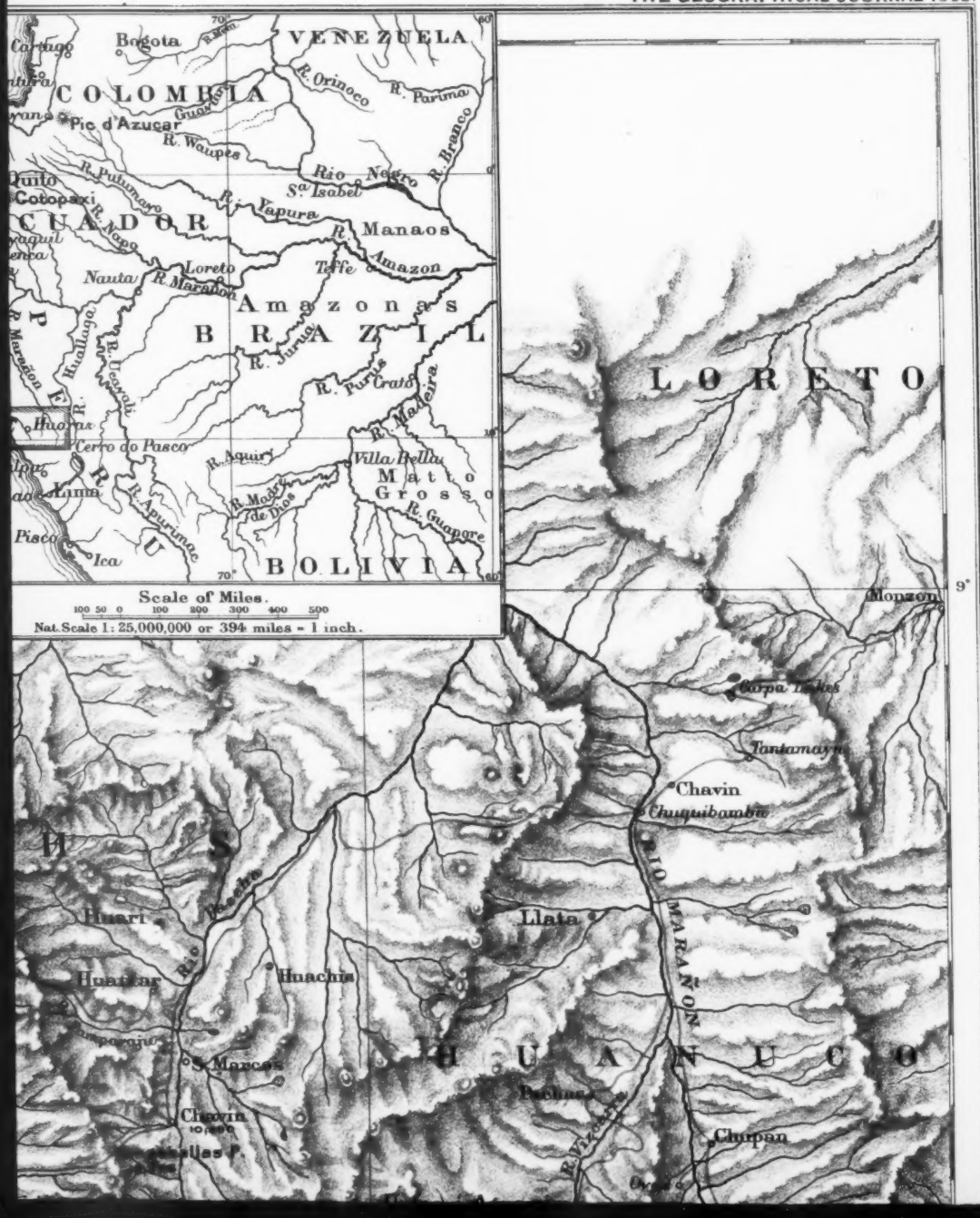
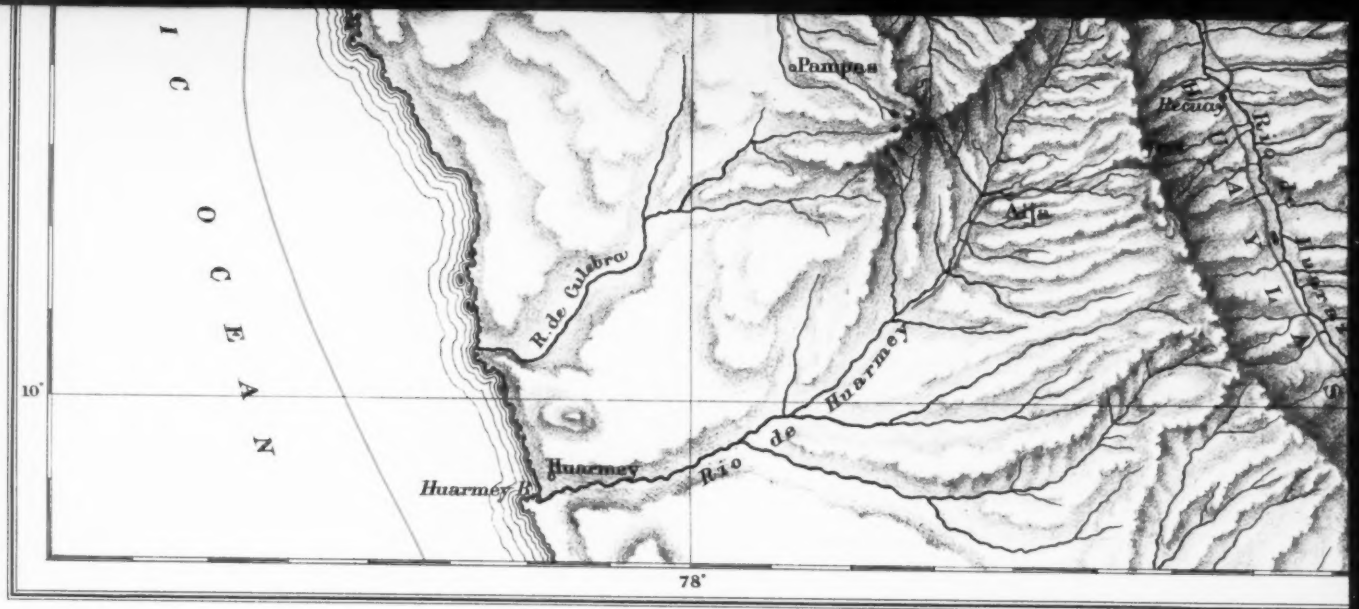
114

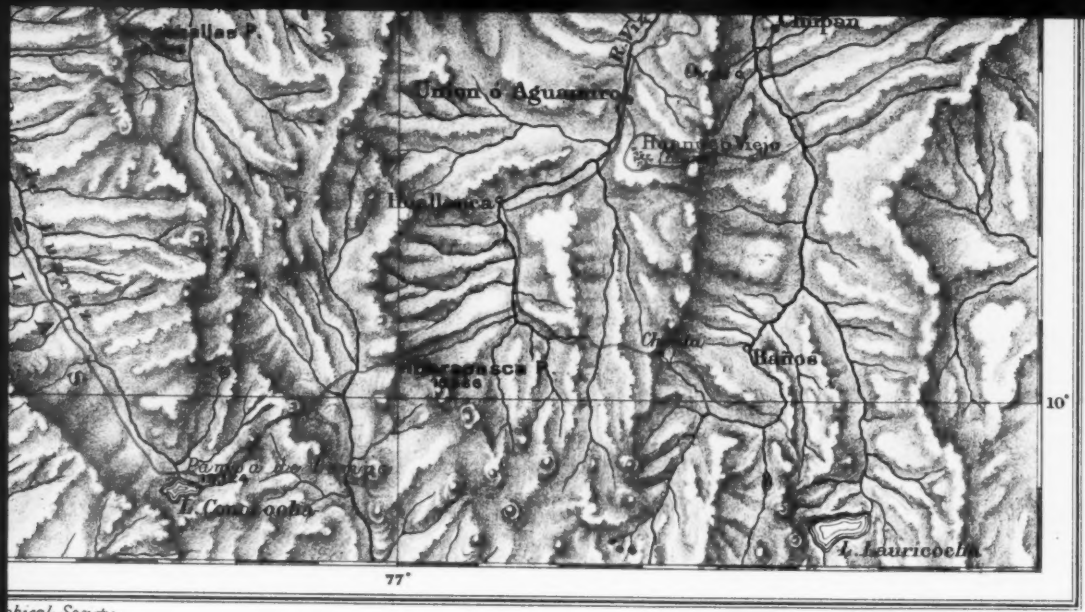
ciety.


SKETCH MAP OF PART OF
PERU.
Showing the routes of
C. R. ENOCK.
1903-4.
Scale of Miles.
10 5 0 10 20 30
Nat. Scale 1: 750,000 or 11·8 Miles = 1 inch.
Routes
Heights in Feet.
78°
9°
PACIFIC OCEAN
RIO DE SANTA
Suchiman
Malaute
Huallas
Mato
Santa
R. de Lacramarca
Chimbote
Chimbote B.
Samanco B.
Samanco
Jumbe o Caceres
Huata
Caraz
7339
Pachpamas
Pueblo Libre
14833
Rio de Nepena
Moro
Nepena
R. de Pocos
Yungay
Huaraz
22,
Mata
Mancos
Shurupay
Quillo
R. de Quillo
Yungar
Jangas
Casma
Casma B.
Yautan
Rio de Casma
Parinacota
R. Quilcay
HUARAZ
9906
Pampas
Caringo
Buenaventura
Quito
Cotopaxi
Valdivia
ECUA
Guayaquil
Cuenca
Loja
Paita
R. Maranon
Pucasmaya
Trujillo
Chimbote
Huaraz
Palpa
Callao
Lima
Pisco
Nat. Scale


Bogota
VENEZUELA
COLOMBIA
R. Orinoco
R. Parima
Pic d'Azucar
R. Waupes
R. Branco
Rio Negro
Quito
Cotopaxi
ECUADOR
R. Napo
R. Yapura
Manaos
Nauta
Loreto
R. Maranon
Teffe
Amazon
Amazonas
BRAZIL
R. Jurua
R. Purus
Crato
R. Madeira
Huanuco
Cerro do Pasco
R. Aquiri
Villa Bella
Mato Grosso
Lima
R. Apurimac
R. Madre de Dios
R. Guapore
Pisco
Ica
BOLIVIA
Scale of Miles.
100 50 0 100 200 300 400 500
Nat. Scale 1: 25,000,000 or 394 miles = 1 inch.
LORETO
Monzon
Tantamayo
Chavin
Chuquibamba
HUANUCO
Huari
Huachis
Llata
R. Marañon
S. Marcos
Chavin
Chupan
Pachas



Published by the Royal Geographical Soci



hical Society.

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